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# Plant Biomass in the Tanana River Basin, Alaska

Bert R. Mead



United States  
Department of  
Agriculture

Forest Service

Pacific Northwest  
Research Station

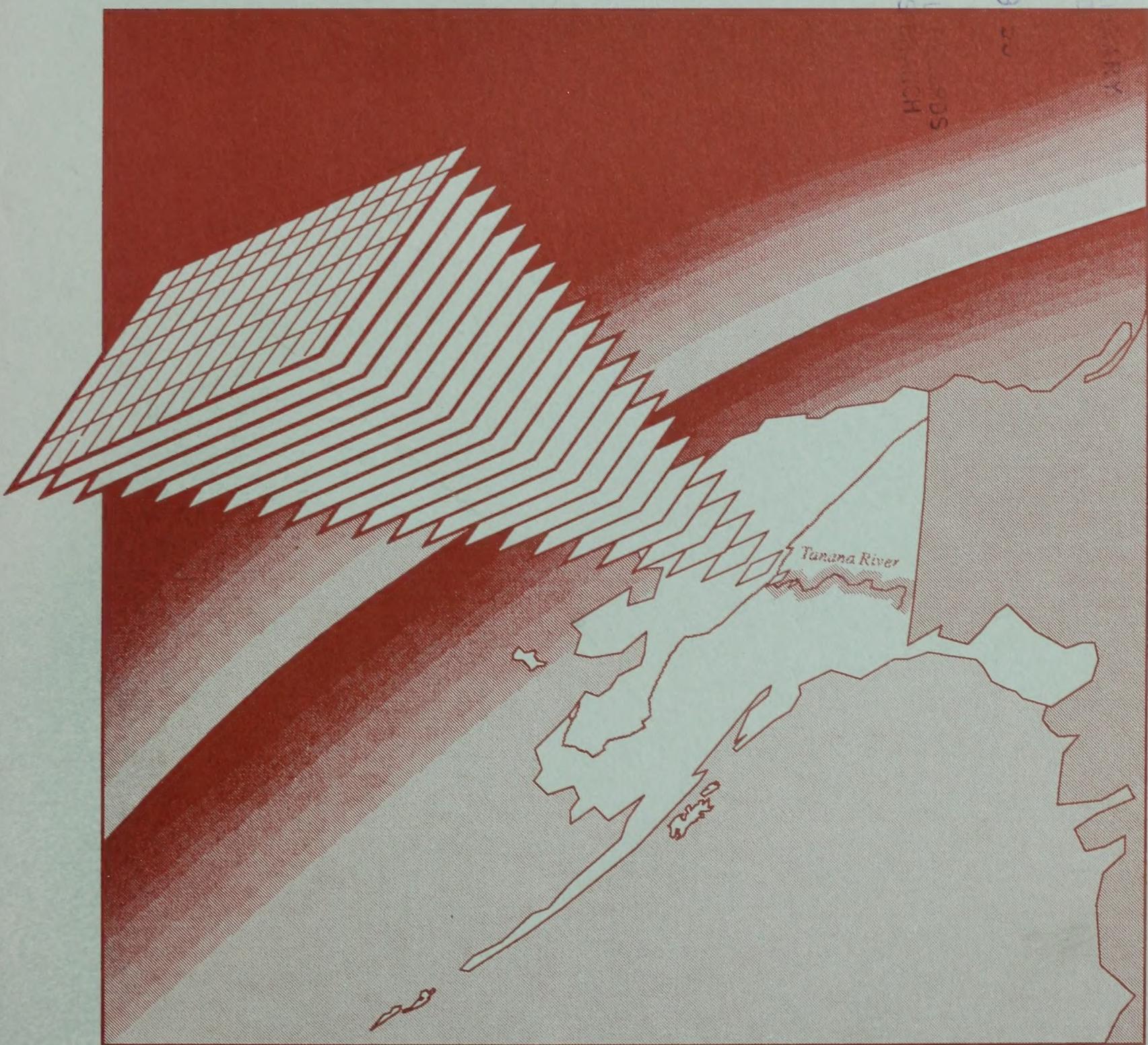
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## **Abstract**

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Vegetation biomass tables are presented for the Tanana River basin. Average biomass for each species of tree, shrub, grass, forb, lichen, and moss in the 13 forest and 30 nonforest vegetation types is shown. These data combined with area estimates for each vegetation type provide a tool for estimating habitat carrying capacity for many wildlife species. Tree biomass is reported for the entire aboveground tree, thereby allowing estimates of total fiber content.

**Keywords:** Biomass, phytomass, Tanana River basin, Alaska, plant ecology.

## **Summary**

Vegetation phytomass tables are presented for the Tanana River basin. Average phytomass for each species of tree, shrub, grass, forb, lichen, and moss in 13 forest and 30 nonforest vegetation types is shown. These data combined with area estimates for each vegetation type provide a tool for estimating habitat carrying capacity for many wildlife species. They can be used for determining stored carbon content in different vegetation types. They also may be used for estimating extent of the resources for traditional uses, such as berry production, and relative abundance of other plants that may be important to a subsistence lifestyle. Tree phytomass is reported for the entire aboveground tree, thereby allowing estimates of total fiber content.

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## **Introduction**

The Inventory and Economics (I&E) Program of the USDA Forest Service, Pacific Northwest Research Station, has responsibility for measuring and evaluating resources in Alaska, California, Oregon, Washington, and Hawaii. The Alaska I&E unit has developed vegetation measurement techniques using phytomass estimates, which quantify nonforest and marginal forest areas as well as heavily timbered vegetation types.

The boreal forest of Alaska is dominated by spruce-birch forest, shrubland, bogs, and other nonforest types. Traditional timber inventory procedures are not well suited to boreal forest types. Timber inventories normally concentrate on highly productive forest lands and large trees. The vegetation resource in the interior of Alaska consists primarily of smaller trees, shrubs, and herbaceous vegetation. Previous studies of interior Alaska show that 95 percent of overstory phytomass on timberland is in trees less than 51 centimeters in diameter (Yarie and Mead 1982). Multiresource procedures appropriate to the boreal forest were developed to measure all types of vegetation on both forest and nonforest land. A major objective of this procedural development was to incorporate phytomass estimates by plant species (Mead 1992).

Several habitat evaluation models have been constructed for wildlife populations in Alaska and elsewhere, which require knowledge of vegetation resources in the area of interest (Hanley and Rogers 1989, Hobbs and Swift 1985, Lennartz 1979, Sheffield 1982, Telfer 1980, U.S. Department of the Interior, Fish and Wildlife Service 1980, Wallmo and others 1977). Foliar cover and phytomass estimates by species provide inputs into wildlife models (Mead and others 1987). This type of vegetation data also has been applied successfully in classifying forest vegetation into plant associations (Reynolds 1990). Plant associations were then used in a system for rating the risk of spruce-beetle outbreaks on the Kenai Peninsula (Reynolds and Hard 1991).

The multiresource inventory of the 13.986-million-hectare Tanana River basin (fig. 1) was conducted in 1982-83 by using the Alaska Integrated Resource Inventory System (AIRIS). The Tanana River basin lies between 141.00° and 152.00° W. longitude and 62°15' and 65°30' N. latitude; this area encompasses 9.46 percent of the land mass of Alaska.

## **Methods**

The AIRIS used regression sampling in a multiphase statistical design. This design called for selected 8-hectare (20-acre) sample plots to be located and measured at four phases:

1. LANDSAT satellite multispectral scanner imagery (MSS).
2. High-altitude, small-scale infrared photography (HAP) 1:60,000 scale.
3. Large-scale infrared photography (LSP) 1:3,000 scale.
4. Ground-measured plots.

All plots were described by using the Alaska vegetation classification system developed by Viereck and others (1986). Statistical analysis, using this system, produced area estimates by vegetation type.

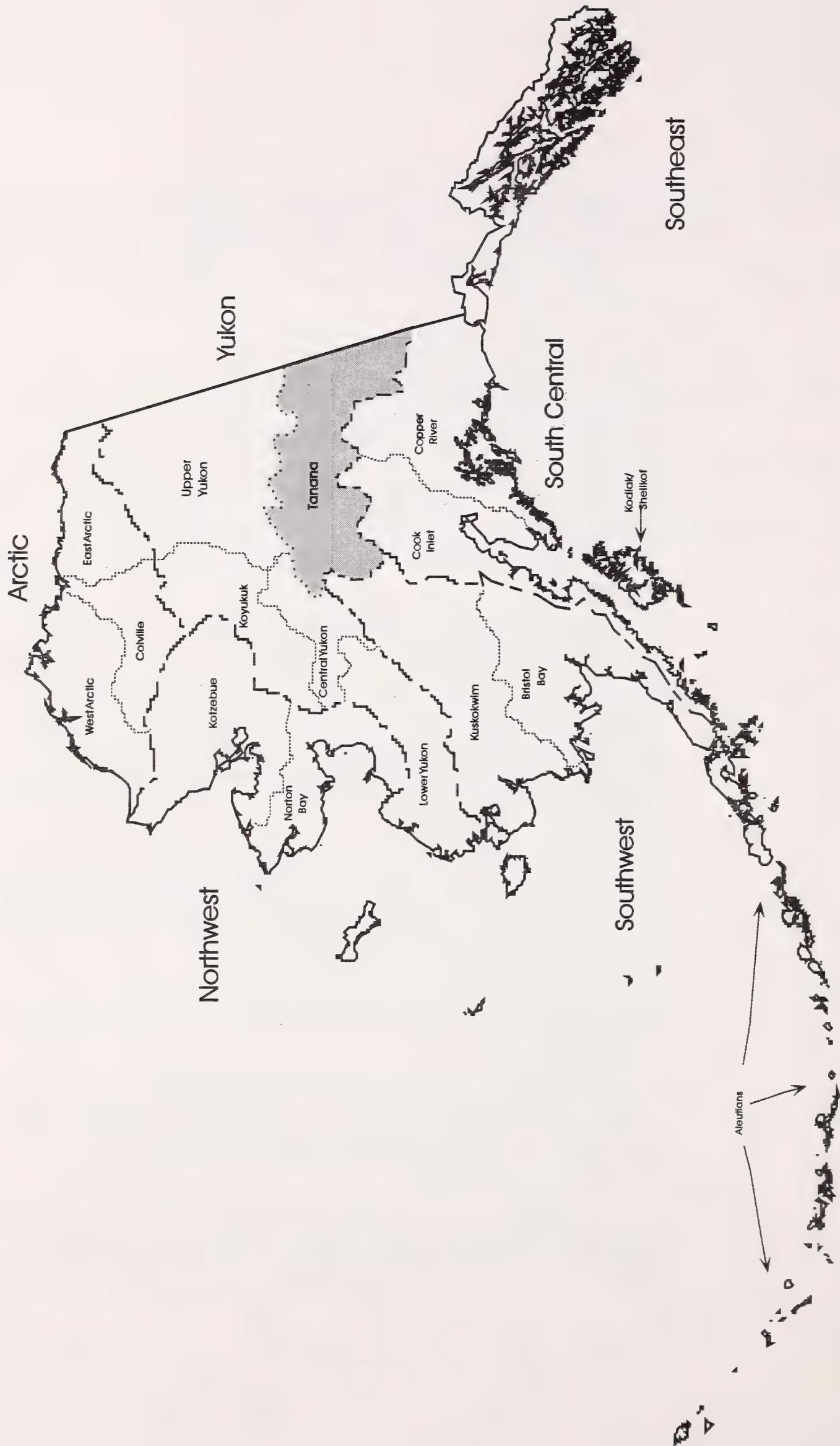


Figure 1—Location of the Tanana River basin within Alaska.

## **Sampling Grid**

Sample plots were located on uniformly spaced geographic grids in both forest and nonforest vegetation types by using a metric map coordinate system, the Universal Transverse Mercator (UTM) grid. LANDSAT MSS samples were taken every 5 kilometers. Vegetation types were delineated and classified on an 8-hectare circular plot on high-altitude, small-scale (1:60,000), color, infrared photography every 10 kilometers. Vegetation was type-mapped on large-scale, color, infrared photography every 20 kilometers. Ground measurement samples were taken every 40 kilometers, thereby resulting in ground samples occurring at 88 locations. At each of these locations, an 8-hectare circular area was sampled, which often represented several distinct vegetation types. A total of 800 tree plots and 328 vegetation plots were measured at these 88 locations. These represented about 160 type-mapped polygons. Figure 2 gives a graphic representation of the sampling grids. This information may also be expressed as proportion of the area sampled, as shown below:

<b>Sample phase</b>	<b>Proportion of area sampled</b>
Satellite imagery	1 hectare sampled for every 12.5 hectares on the ground
High-altitude photos (HAP)	1 hectare sampled for every 1250 hectares on the ground
Large-scale photos (LSP)	1 hectare sampled for every 5000 hectares on the ground
Ground samples	1 hectare sampled for every 20 000 hectares on the ground

## **Vegetation Classification System**

The Alaska vegetation classification system is a multilevel classification, the first level having only three categories: forest, scrub, and herbaceous. The second level uses either species grouping or height class, depending on the category into which the vegetation falls. Level III uses foliar cover for all vegetation except herbaceous. Vegetation on each 8-hectare plot was type-mapped and classified down to level III on all photos, and for forest plots to level IV at the large-scale photo and ground sample levels. There were not enough plots in some categories to develop statistically significant estimates at level III or IV, so some tables report only at level I or II. An abbreviated description of the classification system is given in table 1, and the area in each category is shown in table 2. Ground plots were described to level IV, a species-descriptive level not shown in table 1.

## **Ground Sampling**

Each 8-hectare (20-acre) ground sample area was permanently established. Sample trees were selected by using a relascope at each of 19 points within the 8-hectare area (fig. 3). Basal area factors of 9 square meters per hectare and 6.25 square meters per hectare in the metric system (or about 40 ft<sup>2</sup>/acre and about 27 ft<sup>2</sup>/acre in the U.S. Customary System) were used to select sample trees.

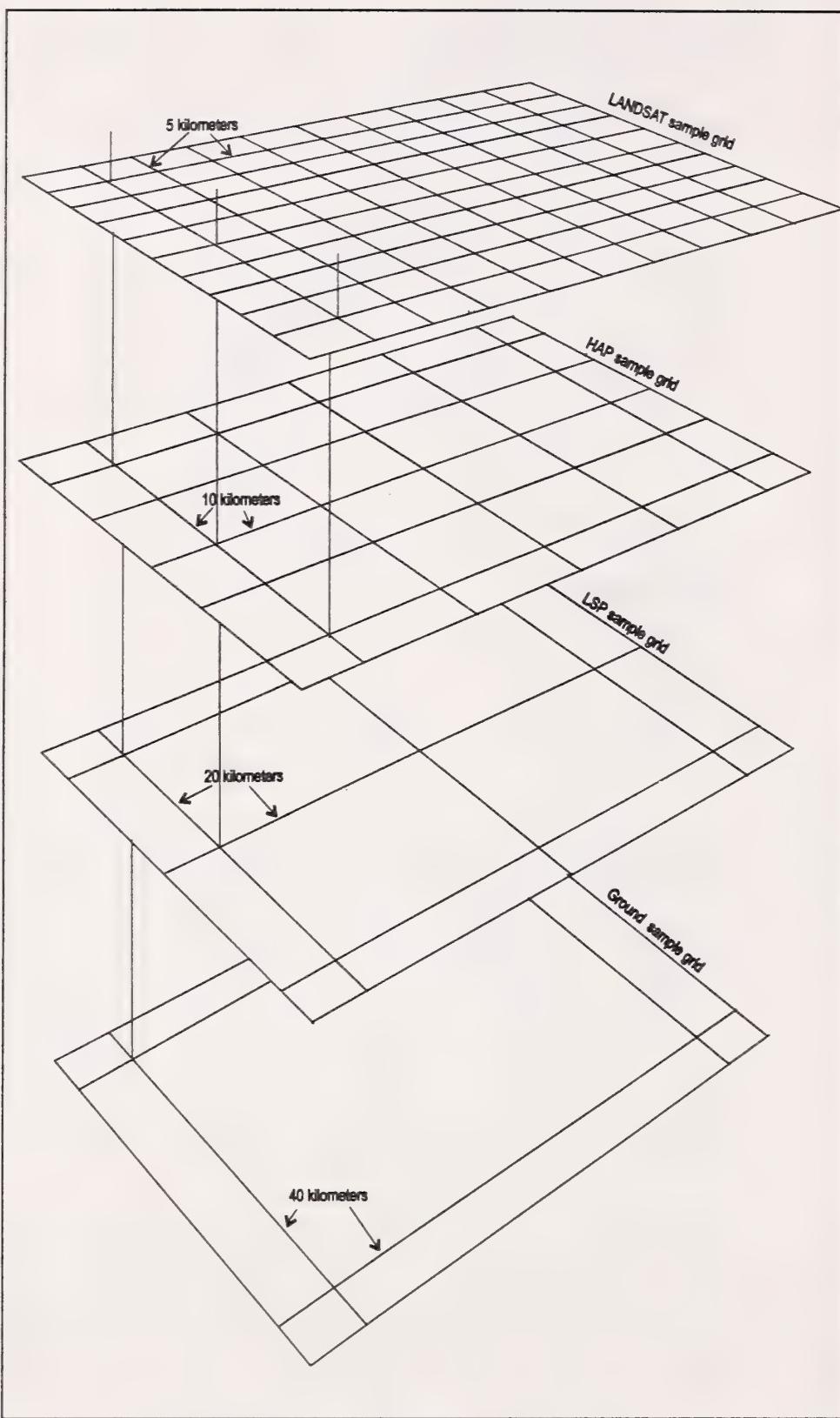


Figure 2—Sample grid spacing at each sampling phase: LANDSAT satellite, high-altitude photography (HAP), large-scale photography (LSP), and ground-sampling phases.

**Table 1—Alaska vegetation classification system**

Level I	Level II	Level III <sup>a</sup>
Forest	Needleleaf	Closed (60-100% canopy closure) Open Woodland
	Broadleaf	Closed (60-100% canopy closure) Open (25-59% canopy closure) Woodland (10-24% canopy closure)
	Mixed	Closed (60-100% canopy closure) Open (25-59% canopy closure) Woodland (10-24% canopy closure)
Scrub	Dwarf tree	Closed (60-100% canopy closure) Open (25-59% canopy closure) Woodland (10-24% canopy closure)
	Tall (>1.5 m)	Closed (75-100% canopy closure) Open (25-74% canopy closure)
	Low (0.2-1.4 m)	Closed (75-100% canopy closure) Open (25-74% canopy closure)
Herbaceous	Dwarf (<0.2 m)	Closed (75-100% canopy closure) Open (25-74% canopy closure)
	Graminoid	Dry Mesic Wet
	Forb	Dry Mesic Wet
	Bryoid	Moss Lichen
	Aquatic	Freshwater Brackish Marine

<sup>a</sup> Level III of dwarf scrub was modified for this inventory from dryas, ericaceous, and willow categories to closed and open categories due to remote sensing limitations in determining small shrub species on aerial photographs.

**Table 2—Area by vegetation type, Tanana River basin, Alaska**

Vegetation type	Area	Proportion
	<i>Thousand hectares</i>	<i>Percent</i>
Closed-canopy needleleaf forest	1305.31	9.3
Open-canopy needleleaf forest	3110.78	22.2
Open-canopy needleleaf woodland	525.81	3.8
Closed-canopy broadleaf forest	1013.58	7.3
Open-canopy broadleaf forest	72.52	.5
Open-canopy broadleaf woodland	88.67	.6
Closed-mixed broadleaf-needleleaf forest	955.30	6.8
Open-mixed broadleaf-needleleaf forest	532.53	3.8
Dwarf tree scrub	938.39	6.7
Tall shrub scrub	672.06	4.8
Low shrub scrub	1317.58	9.4
Dwarf shrub scrub	699.05	5.0
Herbaceous	846.52	6.1
Barren	1602.15	11.5
Water	305.62	2.2
Total, all types	13 985.95	100.0

Other vegetation and tree seedlings were measured on circular fixed-radius plots with an area of 0.01 hectare (5.64-meter radius). These plots were called horizontal-vertical vegetative description plots (HV plots). On these HV plots, the percentage of foliar cover in each natural layer was estimated by using procedures developed by Daubenmire (1959). In a typical vegetation type, there are several natural layers: ground cover, forbs and grasses, low shrubs, tall shrubs, and trees. The heights of these layers differs, however, from bottomland to alpine sites. Because some vegetation types may lack one of the layers, field crews were allowed to determine which layers were present. The heights of these natural layer breaks were measured and recorded, thereby allowing percentage of cover to be measured at variable heights, depending on the type of vegetation found on the plot. Sometimes plants would extend over more than one layer with a different percentage of cover in each layer.

This method was more descriptive than the first two alternatives listed below and much more cost-effective than the last two alternatives considered.

Alternative strategies considered include the following:

1. Measuring percentage of cover at set height intervals (every 0.5 meter).
2. Taking one height measurement for all plants in a particular group such as shrubs, forbs, grasses, or species.
3. Measuring the height and percentage of cover of each plant.

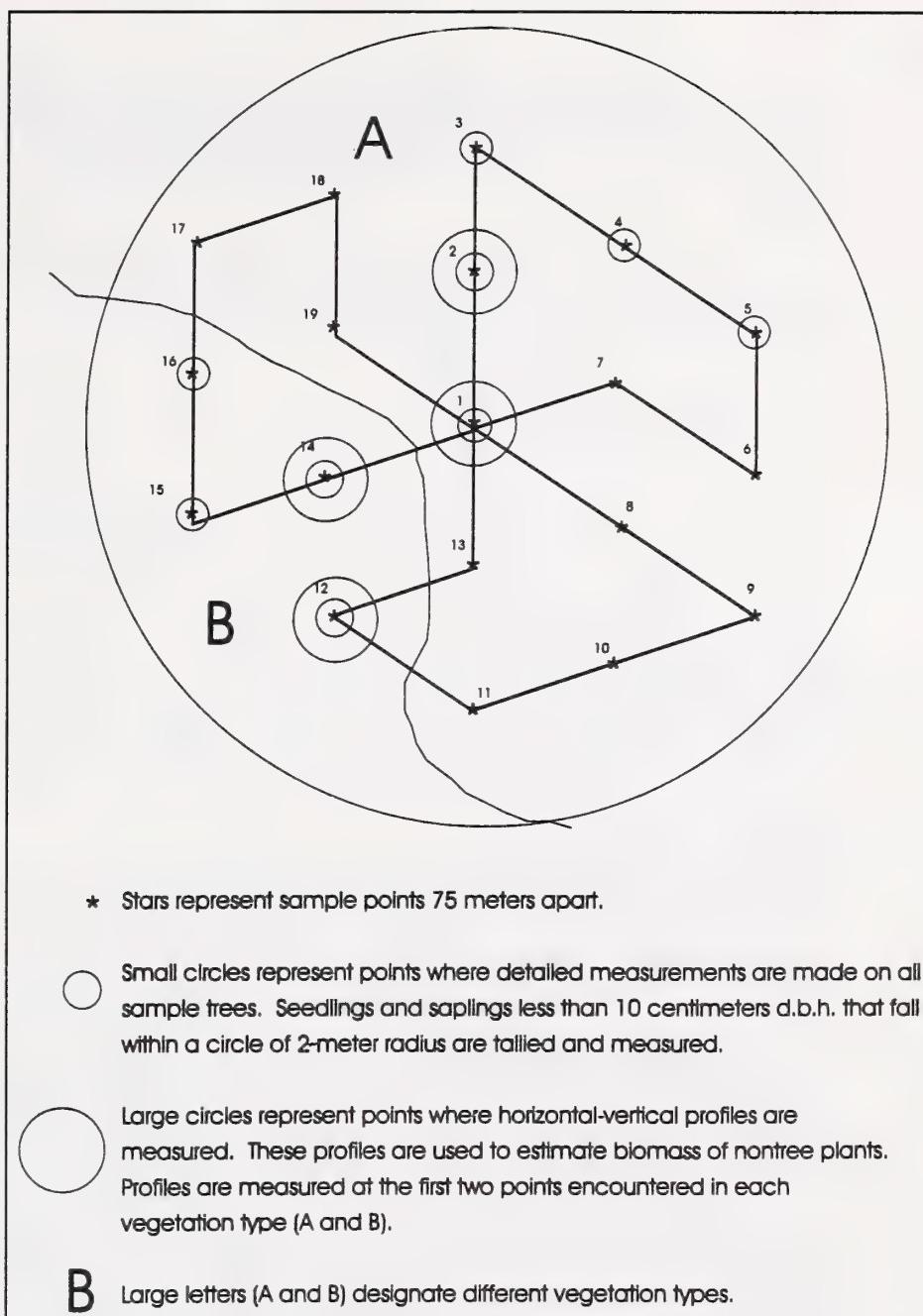


Figure 3—Distribution of 19 ground sampling points within the 8-hectare circular area.

**4.** Using a unique parameter (for example, basal area and leaf length) to predict phytomass for each species rather than using percentage of cover as the predictor for all species.

#### Phytomass Estimation

Phytomass was calculated for various vegetation types in the following way:

##### **Shrubs, forbs, grasses, lichens, and mosses—**

- 1.** We applied species-specific coefficients to the percentage of cover and height measurements.
- 2.** If a species-specific coefficient had not been developed for that plant, we applied a coefficient for the most similar plant.

**Trees**—We determined tree phytomass by using diameter at breast height (d.b.h.) and total tree height measurements and applying these to species phytomass equations. Tree phytomass shown in all tables is total aboveground weight including foliage.

Both the nontree phytomass coefficients and the tree phytomass equations were taken from previous studies (Alemdag 1984; Manning and others 1984; Singh 1983; Yarie and Mead 1988, 1989).

Phytomass was expressed in terms of ovendry weight, the unit of measure most commonly used across all plant groups.

#### Nontree Phytomass Coefficients

The Alaska inventory team developed phytomass coefficients to predict the ovendry weight of a species of plant from average percentage of foliar cover and height. They developed the coefficients through cooperative studies with the University of Alaska, Fairbanks (Yarie and Mead 1988). The studies produced phytomass predictors for 120 of the most common species encountered. These species represent major plant taxonomic families and lifeforms, including lichens and mosses. A special consideration arose in the case of mosses, which in peat conditions can extend many feet below the ground surface. Only the green, active portion of moss phytomass is predicted by this method.

Percentage of foliar cover for each sampled species was related to ovendry phytomass by means of regression analysis. This analysis showed a straight line relation between percentage of foliar cover and weight. The slope of that line is hereafter referred to as a phytomass regression coefficient.

Phytomass coefficient development followed techniques similar to those first employed by Harcombe and Marks (1977) in a mesic forest in Texas, which are applicable to other areas as well. They involve using a three-dimensional sampling frame made of rope or plastic pipe to randomly sample a set volume of vegetation 0.6096 meter (2 ft) wide, 0.9144 meter (3 ft) long, and 2.45 meters (8.25 ft) high. Foliar cover is measured for each plant species, and plants are clipped, bagged, ovendried, and weighed in vertical segments of 0.3048 meter (1 ft). A regression analysis related foliar cover and measured weights to develop an equation for predicting weight from measured foliar cover for each species. The regression analysis resulted in a set of regression coefficients that could be used with height measurements to predict phytomass. The regression coefficients predicted weight for a 10-centimeter (4-in) segment based on percentage of the plot area with foliar cover. Measuring the height of the plants in each inventory sample plot allows us to determine the number of 10-centimeter vertical segments and thus the total phytomass.

A discussion of errors associated with the regression coefficients is available in Yarie and Mead (1989). Over 70 percent of the regression equations had  $r^2$  greater than 0.70. An  $r^2$  of 0.70 indicates that 70 percent of the variation in weight was associated with the amount of foliar cover. At lower  $r^2$  values, less of the variation is accounted for by an estimate of percentage of cover, and a less reliable estimate of weight is predicted from percentage of cover for that plant relative to a plant with a higher  $r^2$ . An  $r^2$  of 1.00 would indicate a 100-percent correlation between foliar cover and plant weight. A brief summary of  $r^2$  for plant groups is given in table 3.

**Table 3—Plant group and range of coefficient of determination ( $r^2$ ) associated with phytomass coefficients**

Plant group	Range of $r^2$
Mosses	0.67-0.99
Ferns	.57-.93
Grasses	.66-.97
Forbs	.41-.97
Midsize shrubs	.64-.98
Tall shrubs	.55-.86

#### **Tree Phytomass**

Whole-tree phytomass equations were chosen by searching the available literature for tree species equations in areas geographically and climatically similar to interior Alaska. Where several species equations were available, one was selected by using the following evaluation criteria:

1. Equations using d.b.h. and total tree height as predictors were preferred to equations using diameter only. Tree height has been shown to better reflect site differences in total tree weight.
2. Equations developed in an area similar in latitude and climate to interior Alaska were preferred.
3. Equations developed by using a wide diameter range of trees were selected over those that did not.
4. Equations using the largest number of trees and having the lowest standard errors were preferred.
5. Sets of equations predicting both whole tree weight as well as weight of individual components (for example, bole, branch, and foliage) were preferred over those that did not.
6. Equations using metric standards of measurement and metric outputs were preferred over those that did not.

Species	Equation source
White spruce	Yukon Territory, Canada, Manning (1984)
Black spruce	Yukon Territory, Canada, Manning (1984)
Tamarack	Northwest Territories, Canada, Singh (1983)
Aspen	Northwest Territories, Canada, Singh (1983)
Cottonwood	Northwest Territories, Canada, Singh (1983)
Birch	Ontario, Canada, Alemdag (1984)

Seedling phytomass of tree species was estimated by using HV plot percentage of cover data and phytomass coefficients.

Dead-tree phytomass was estimated by using the live-tree equations. The weight predicted was then reduced by a set percentage based on a field classification into one of six snag- or log-condition classes representing different stages of decomposition. Our snag-log condition classes are a modification of earlier descriptions by Maser and others (1979):

Condition class	Percent of deduction
Dead, intact	0
Loose bark; secondary branches gone	20
Clean, no branches	40
Clean, broken bole	60
Broken and decomposing	80
Decomposed	100

Tables displaying the vertical weight distribution of phytomass are available from the inventory and economics program. These may be useful in determining amount of browse that is either available above a certain snow depth or obtainable for a particular animal. Space limitations prevent their inclusion in this report. These tables are available for plants within the lowest two meters of height on the HV plot.

## Results Forested Vegetation Types

Distribution of phytomass by plant species is displayed in all tables. Appendix table 6 shows the distribution of tree phytomass on forested vegetation types in the Tanana River basin. Live tree phytomass is highest in the closed-canopy needleleaf vegetation type, followed by the closed-canopy broadleaf type. The closed-canopy, mixed-broadleaf/needleleaf forest type had only 60 percent (28 930 kilograms per hectare) of the live tree phytomass found in closed-canopy, needleleaf forest types (47 933 kilograms per hectare). Dead tree phytomass as a percentage of live tree phytomass was highest in the closed-canopy mixed type (12.5 percent), perhaps because this is a transitional plant succession type from broadleaf to needleleaf forest. Woodland needleleaf forests had the lowest percentage of dead tree phytomass (2.5 percent).

The shrublike, dwarf-tree forest type, which is comprised mainly of stunted black spruce, had only 20 percent (9412 kilograms per hectare) as much live-tree phytomass as the closed-canopy, needleleaf forest type (47 933 kilograms per hectare). The dwarf-tree type occupies 6.7 percent of the total land area in the river basin, thereby making it a substantial component of total phytomass despite its low tonnage per hectare.

Among forest vegetation types, the total number of plant species was highest in the open-canopy, needleleaf type with 156 different species encountered and lowest in the closed-canopy, needleleaf type with 81 (table 4). The number of species encountered is dependent on the number of plots measured, the size of plots used, the dispersion of the vegetation type, the ability of the crew to distinguish among species, and many other factors in addition to the natural diversity present. The table of species counts per vegetation type is not a species diversity index, but it is a method by which vegetation diversity can be preliminarily assessed or ranked within broad categories.

**Table 4—Plant species count and number of sample locations by forest vegetation type, Tanana River basin**

Plant group	Closed needleleaf forest	Broadleaf forest	Closed mixed forest	Open needleleaf forest	Open mixed forest	Woodland needleleaf forest
<i>Number of species</i>						
Trees	6	6	7	6	6	6
Shrubs	27	26	28	41	29	35
Forbs	18	33	35	61	24	31
Grasses	3	3	5	6	6	5
Lichens	13	7	9	18	13	15
Mosses	14	15	18	24	15	20
Total	81	90	102	156	93	112
<i>Number of locations</i>						
	13	16	14	32	13	15

#### Nonforest Vegetation Types

Total aboveground phytomass on nonforested vegetation types ranges from a low of 550 kilograms per hectare in the open-canopy, dwarf scrub type to 11 630 kilograms per hectare in the closed-canopy, tall shrub type. Even on nonforest vegetation types with less than 10-percent tree crown closure, there is some tree phytomass. This ranges from none on some types to 4326 kilograms per hectare on the closed-canopy, tall shrub type. Shrub phytomass expressed as a percentage was highest on the open-canopy, tall shrub type comprising 80 percent of the total phytomass and lowest on the wet-graminoid-herbaceous type comprising only 2 percent of the total. Shrub phytomass ranged from a high of 6380 kilograms per hectare to a low of 132 kilograms per hectare. Distribution of other components is shown below:

Vegetation group	Total phytomass	Vegetation type
<i>Percent</i>		
Shrubs	High	79
	Low	23
Lichens	High	46
	Low	<1
Moss	High	38
	Low	2
Forb	High	10
	Low	<1
Grass	High	35
	Low	2

**Table 5—Plant species count and number of sample locations by nonforest vegetation type, Tanana River basin**

Plant group	Dwarf tree scrub	Closed tall shrub	Open tall shrub	Closed low shrub	Dwarf shrub	Mesic grass	Wet grass	Dry forb
<i>Number of species</i>								
Trees	5	5	5	5	0	3	3	0
Shrubs	28	28	28	29	14	20	17	11
Forbs	26	26	20	40	26	8	9	6
Grasses	5	4	3	6	5	3	5	3
Lichens	12	5	6	13	11	9	6	9
Mosses	15	13	13	12	9	7	7	4
Total	91	81	75	105	65	50	47	33
<i>Number of locations</i>								
	13	14	7	9	2	5	5	1

Numbers of different species tallied were highest for nonforest types on the closed-canopy, low shrub type with 105 different species recorded (table 5) and lowest in the various herbaceous types ranging from 33 to 50 different species tallied. Again, the number of plots measured will be a very influential factor in these numbers.

## English Equivalents

- 1 millimeter = 0.039 inch
- 1 meter = 3.281 feet or 1.094 yards
- 1 decimeter = 3.3937 inches
- 1 hectare = 2.471 acres
- 1 square meter = 10.7639 square feet
- 1 cubic meter = 1.308 cubic yards
- 1 kilogram = 2.205 pounds
- 1 kilogram per hectare = 0.89218 pound per acre
- 1.120 85 kilograms per hectare = 1 pound per acre

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**Appendix A:  
Phytomass on  
General Forest  
Vegetation Types**

Tables 6-19 summarize forest and nonforest types, and tables 20-54 give species data on individual level III types (in the Alaska vegetation classification system), which may be more useful in models of wildlife carrying capacity. Tables 55-60 list the scientific naming authority for each species encountered and provide additional information on frequency of occurrence and the phytomass coefficient used for each species.

**Table 6—Aboveground phytomass of trees on forested vegetation types in the Tanana River basin**

Species	Vegetation type and crown-closure percentage						
	Closed needleleaf	Open needleleaf	Woodland needleleaf	All broadleaf	Closed mixed needlef./ broadleaf	Open mixed needlef./ broadleaf	All needlef. dwarf
	60-100	25-59	10-24	10-100	60-100	25-59	10-100
<i>Kilograms per hectare</i>							
<i>Larix laricina</i>	2182	69	275	3	t <sup>a</sup>	92	1013
<i>Picea glauca</i>	12 769	11 803	5793	6355	11 726	5483	393
<i>Picea mariana</i>	31 289	16 383	3632	2845	7178	4583	6540
Total, needleleaf	46 240	28 255	9700	9203	18 904	10 158	7946
<i>Betula papyrifera</i>	968	1457	56	18 743	—	11 241	1452
<i>Populus balsamifera</i>	—	1	6	544	5697	106	—
<i>Populus tremuloides</i>	61	6	957	14 445	4319	6155	14
<i>Populus trichocarpa</i>	664	—	—	—	10	—	—
Total, broadleaf	1693	1464	1019	33 732	10 026	17 502	1466
Total, live trees	47 933	29 719	10 719	42 935	28 930	27 660	9412
% of phytomass	(94.62)	(87.25)	(73.33)	(89.05)	(91.20)	(88.19)	(75.96)
Other plants	2725	4343	3898	5279	2793	3703	2978
Total, live plants	50 658	34 062	14 617	48 214	31 723	31 363	12 390
Downed trees and logs	1273	492	80	173	269	—	—
Standing dead trees	2564	1074	191	1353	3265	786	434
Total, dead trees	3837	1566	271	1526	3534	786	434
Total, live and dead	54 495	35 628	14 888	49 740	35 257	32 149	12 824

— = plant not sampled in this type.

<sup>a</sup>t = trace, less than 1 kilogram per hectare.

**Table 7—Aboveground phytomass of alder, birch, and willow shrubs on forested vegetation types in the Tanana River basin**

Species	Vegetation type and crown-closure percentage						
	Closed needleleaf 60-100	Open needleleaf 25-59	Woodland needleleaf 10-24	All broadleaf 10-100	Closed mixed needlef./ broadleaf 60-100	Open mixed needlef./ broadleaf 25-59	All needlef. dwarf 10-100
<i>Kilograms per hectare</i>							
<i>Alnus crispa</i>	365	908	38	2318	1166	1013	530
<i>Alnus tenuifolia</i>	—	238	18	—	—	—	—
<i>Alnus sinuata</i>	73	104	t <sup>a</sup>	—	—	—	125
<i>Betula nana</i>	30	221	274	—	25	59	365
<i>Betula glandulosa</i>	113	544	1283	169	81	406	87
<i>Betula occidentalis</i>	—	5	118	350	—	54	30
<i>Salix alaxensis</i>	26	6	63	—	—	1	2
<i>Salix interior</i>	—	18	—	—	—	—	—
<i>Salix</i> sp.	129	453	284	516	343	391	227
<i>Salix bebbiana</i>	31	7	—	1	31	—	—
<i>Salix arbusculoides</i>	2	—	13	—	—	—	—
<i>Salix lanata</i>	—	2	—	—	—	36	—
<i>Salix glauca</i>	407	126	277	514	11	53	3
<i>Salix reticulata</i>	—	20	3	—	—	—	—
<i>Salix planifolia</i>	84	—	135	254	17	30	7
<i>Salix myrtillifolia</i>	—	45	1	—	—	—	—
<i>Salix monticola</i>	—	—	23	—	—	—	—
Total, tall shrub	1260	2697	2530	4122	1674	2043	1376
% of live phytomass	(2.49)	(7.92)	(17.31)	(8.55)	(5.28)	(6.51)	(11.11)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 8—Aboveground phytomass of other shrubs on forested vegetation types in the Tanana River basin**

Species	Vegetation type and crown-closure percentage						
	Closed needleleaf 60-100	Open needleleaf 25-59	Woodland needleleaf 10-24	All broadleaf 10-100	Closed mixed needlelf./ broadleaf 60-100	Open mixed needlelf./ broadleaf 25-59	All needlelf. dwarf 10-100
<i>Kilograms per hectare</i>							
<i>Andromeda polifolia</i>	—	5	2	—	1	—	6
<i>Anemone parviflora</i>	—	—	—	—	—	t <sup>a</sup>	—
<i>Arctostaphylos alpina</i>	2	—	—	—	—	—	2
<i>Arctostaphylos uva-ursi</i>	—	—	2	7	1	2	—
<i>Arctostaphylos rubra</i>	—	20	16	—	t	5	7
<i>Artemisia tilesii</i>	—	—	—	—	t	—	—
<i>Artemisia</i> sp.	—	—	—	—	1	—	—
<i>Cassiope tetragona</i>	—	4	1	—	—	—	—
<i>Chamaedaphne calyculata</i>	12	9	18	—	1	16	41
<i>Diapensia lapponica</i>	—	—	—	—	—	—	1
<i>Dryas octopetala</i>	—	2	1	—	—	—	—
<i>Dryas integrifolia</i>	—	t	—	—	—	—	—
<i>Dryas</i> sp.	—	t	3	10	—	t	—
<i>Empetrum nigrum</i>	6	17	17	1	4	1	9
<i>Juniperus communis</i>	—	2	—	6	—	80	6
<i>Ledum groenlandicum</i>	473	235	222	137	180	337	130
<i>Ledum palustre decumbens</i>	52	92	61	16	12	100	319
<i>Linnaea borealis</i>	2	2	1	12	16	1	t
<i>Myrica gale</i>	—	7	7	—	—	—	—
<i>Potentilla fruticosa</i>	—	19	35	1	—	2	13
<i>Ribes triste</i>	2	3	—	4	11	3	—
<i>Ribes</i> sp.	—	3	—	—	3	—	—
<i>Ribes hudsonianum</i>	2	—	—	—	—	—	—
<i>Rosa acicularis</i>	15	18	6	145	79	26	3
<i>Rubus arcticus</i>	t	t	t	1	—	—	t
<i>Rubus idaeus</i>	—	—	—	t	—	—	—
<i>Rubus pedatus</i>	—	t	—	—	—	—	—
<i>Rubus chamaemorus</i>	4	3	4	t	t	3	10
<i>Rubus</i> sp.	t	—	—	—	—	—	—
<i>Rubus spectabilis</i>	—	—	—	t	—	2	—
<i>Rumex arcticus</i>	—	—	—	—	3	—	—
<i>Shepherdia canadensis</i>	2	2	1	11	15	61	t
<i>Spiraea beauverdiana</i>	9	48	13	39	81	33	41
<i>Vaccinium oxycoccus</i>	—	t	1	—	t	—	2
<i>Vaccinium vitis-idaea</i>	64	34	24	29	55	53	32
<i>Vaccinium uliginosum</i>	247	427	352	77	120	292	368
<i>Viburnum edule</i>	t	7	—	249	73	1	—
Total, low shrub	892	959	787	745	656	1018	990
% of live phytomass	(1.76)	(2.82)	(5.38)	(1.55)	(2.07)	(3.25)	(7.99)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 9—Aboveground phytomass of forbs on forested vegetation types in the Tanana River basin**

Species	Vegetation type and crown-closure percentage						
	Closed needleleaf 60-100	Open needleleaf 25-59	Woodland needleleaf 10-24	All broadleaf 10-100	Closed mixed needlelf./ broadleaf 60-100	Open mixed needlelf./ broadleaf 25-59	All needlelf. dwarf 10-100
<i>Kilograms per hectare</i>							
<i>Achillea</i> sp.	—	—	—	t <sup>a</sup>	—	—	—
<i>Aconitum delphinifolium</i>	t	—	t	t t	—	—	—
<i>Actaea rubra</i>	—	—	—	t t	—	—	—
<i>Anemone richardsonii</i>	—	t	—	—	—	—	—
<i>Anemone</i> sp.	t	t	—	—	—	—	—
<i>Aster</i> sp.	—	—	—	—	t	—	—
<i>Astragalus</i> sp.	—	—	—	2	—	2	—
<i>Boschniakia rossica</i>	—	t	—	—	t	—	—
<i>Boykinia richardsonii</i>	—	1	—	—	—	—	—
<i>Campanula aurita</i>	—	—	t	—	—	—	—
<i>Cardamine</i> sp.	—	t	—	—	—	—	—
<i>Castilleja</i> sp.	—	—	—	—	t	t t	—
<i>Compositae</i> family	—	t	—	—	—	—	—
<i>Cornus canadensis</i>	1	4	1	4	7	4	t
<i>Delphinium brachycentrum</i>	—	t	—	—	—	—	—
<i>Dodecatheon</i> sp.	—	t	—	—	—	—	—
<i>Epilobium</i> sp.	—	—	t	—	—	—	—
<i>Epilobium angustifolium</i>	1	6	4	38	19	14	4
<i>Epilobium latifolium</i>	—	t	t	—	—	—	—
<i>Equisetum sylvaticum</i>	15	28	6	26	13	6	11
<i>Equisetum scirpoides</i>	1	2	6	1	t	1	1
<i>Equisetum</i> sp.	t	2	—	—	10	—	t
<i>Equisetum arvense</i>	7	4	1	4	1	8	4
<i>Equisetum pratense</i>	1	2	t	t	—	2	1
<i>Equisetum palustre</i>	—	t	—	3	—	—	—
Fern	—	—	—	—	—	—	—
Forb	—	—	t	—	—	t t	—
<i>Fragaria virginiana</i>	—	—	—	—	—	—	—
<i>Galium</i> sp.	—	—	—	—	2	5	—
<i>Galium boreale</i>	—	—	t	1	—	—	—
<i>Geocaulon lividum</i>	5	7	t	1	9	t	7
<i>Goodyera repens</i>	—	—	—	—	—	—	—
<i>Gymnocarpium dryopteris</i>	—	—	t	1	t t	—	—
<i>Hedysarum</i>	—	—	t	—	1	—	—
<i>Iris</i> sp.	—	—	t	—	—	—	t
<i>Lupinus</i> sp.	—	—	t	—	—	—	—
<i>Lupinus arcticus</i>	—	—	t	—	—	—	—
<i>Lupinus nootkatensis</i>	—	—	—	—	—	2	—
<i>Mertensia paniculata</i>	1	1	1	12	9	9	2
<i>Moneses uniflora</i>	—	—	t	—	t t	—	—
Mushroom	t	t	t	t	t t	t	—
Other unidentified	6	7	8	5	6	6	13
<i>Papaver macounii</i>	—	—	—	—	—	—	—
<i>Papaver lapponicum</i>	—	—	t	—	—	—	—
<i>Parnassia palustris</i>	—	—	t	—	—	—	—
<i>Pedicularis capitata</i>	—	t	t	—	—	—	—
<i>Petasites hyperboreus</i>	5	4	3	t	—	1	5
<i>Pedicularis labradorica</i>	—	—	—	—	—	—	—

**Table 9—Aboveground phytomass of forbs on forested vegetation types in the Tanana River basin  
(continued)**

Species	Vegetation type and crown-closure percentage						
	Closed needleleaf 60-100	Open needleleaf 25-59	Woodland needleleaf 10-24	All broadleaf 10-100	Closed mixed needlelf./ broadleaf 60-100	Open mixed needlelf./ broadleaf 25-59	All needlelf. dwarf 10-100
<i>Kilograms per hectare</i>							
<i>Pedicularis</i> sp.	—	t	1	—	—	—	—
<i>Petasites frigidus</i>	1	t	1	—	—	t	1
<i>Petasites</i> sp.	—	t	—	—	—	—	t
<i>Polemonium</i> sp.	—	—	—	—	—	t	—
<i>Polemonium acutiflorum</i>	—	t	1	—	—	—	3
<i>Polygonum alaskanum</i>	2	3	—	6	3	—	t
<i>Polygonum</i> sp.	—	—	—	1	—	—	—
<i>Polygonum bistorta</i>	—	t	—	—	—	1	1
<i>Potentilla palustris</i>	—	8	—	—	—	—	—
<i>Potentilla norvegica</i>	—	63	—	—	—	—	—
<i>Pyrola</i> sp.	t	t	1	2	—	—	t
<i>Pyrola secunda</i>	t	t	—	t	t	t	t
<i>Pyrola minor</i>	—	—	—	—	t	4	t
<i>Pyrola asarifolia</i>	—	—	—	1	t	t	—
<i>Pyrola grandiflora</i>	—	t	—	2	1	—	—
<i>Ranunculus</i> sp.	—	t	—	—	—	—	—
<i>Rumex</i> sp.	—	—	t	2	5	—	—
<i>Sanguisorba</i> sp.	—	—	t	—	—	—	t
<i>Saussurea angustifolia</i>	—	t	—	—	—	—	1
<i>Saxifraga tricuspidata</i>	—	t	1	—	—	—	—
<i>Saxifraga</i> sp.	—	t	t	—	—	—	—
<i>Saxifraga bronchialis</i>	—	t	—	—	—	—	—
<i>Saxifraga hieracifolia</i>	—	t	—	—	—	—	—
<i>Smilacina stellata</i>	—	—	—	—	1	—	—
<i>Solidago spathulata</i>	—	t	—	—	—	—	—
<i>Solidago multiradiata</i>	—	—	1	—	—	—	—
<i>Spiranthes romanzoffiana</i>	t	t	—	—	—	—	—
<i>Stellaria calycantha</i>	—	t	—	—	—	—	—
<i>Stellaria</i> sp.	—	t	t	t	t	t	1
<i>Tofieldia</i> sp.	—	—	t	—	—	—	—
<i>Trientalis europaea</i>	—	—	t	t	—	—	—
<i>Valeriana capitata</i>	—	t	t	—	—	—	—
<i>Viola</i> sp.	—	t	—	1	—	—	—
<i>Woodsia alpina</i>	—	t	—	—	—	t	—
<i>Zygadenus elegans</i>	—	—	—	—	—	—	t
Total, forbs	46	141	43	116	97	65	47
% of live phytomass	(0.09)	(0.41)	(0.29)	(0.24)	(0.31)	(0.21)	(0.38)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

Table 10—Aboveground phytomass of grass and grasslike species on forested vegetation types in the Tanana River basin

Species	Vegetation type and crown-closure percentage						
	Closed needleleaf 60-100	Open needleleaf 25-59	Woodland needleleaf 10-24	All broadleaf 10-100	Closed mixed needlef./ broadleaf 60-100	Open mixed needlef./ broadleaf 25-59	All needlef. dwarf 10-100
<i>Kilograms per hectare</i>							
<i>Agropyron</i> sp.	—	—	—	5	—	t <sup>a</sup>	—
<i>Calamagrostis canadensis</i>	—	64	44	107	37	96	53
<i>Calamagrostis</i> sp.	6	—	—	—	—	1	1
<i>Carex rostrata</i>	—	15	—	—	—	—	—
<i>Carex</i> sp.	2	29	56	—	5	8	70
<i>Eriophorum</i> sp.	—	t	11	—	6	—	15
<i>Festuca altaica</i>	—	t	—	—	—	—	—
<i>Festuca</i> sp.	—	—	1	—	—	3	—
Grass	11	10	9	13	11	13	3
<i>Scirpus</i> sp.	—	—	—	—	t	—	—
Total, grasses	19	118	121	125	59	121	142
% of live phytomass	(0.04)	(0.35)	(0.83)	(0.26)	(0.19)	(0.39)	(1.15)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 11—Aboveground phytomass of lichens on forested vegetation types in the Tanana River basin**

Species	Vegetation type and crown-closure percentage						
	Closed needleleaf	Open needleleaf	Woodland needleleaf	All broadleaf	Closed mixed needlelf./ broadleaf	Open mixed needlelf./ broadleaf	All needlelf. dwarf
	60-100	25-59	10-24	10-100	60-100	25-59	10-100
<i>Kilograms per hectare</i>							
<i>Cetraria cucullata</i>	1	4	12	—	—	1	4
<i>Cetraria islandica</i>	1	2	t <sup>a</sup>	—	t	—	1
<i>Cetraria nivalis</i>	—	t	t	—	—	5	—
<i>Cetraria</i> sp.	1	t	5	1	—	—	—
<i>Cladina alpestris</i>	7	t	—	—	—	—	3
<i>Cladina mitis</i>	11	9	5	—	t	6	11
<i>Cladina rangiferina</i>	2	—	—	—	—	—	—
<i>Cladina</i> sp.	44	46	65	7	9	32	39
<i>Cladonia coccifera</i>	—	t	—	—	—	—	—
<i>Cladonia coniocraea</i>	—	—	—	—	—	t	—
<i>Cladonia</i> sp.	6	12	16	5	7	4	8
<i>Dactylina</i> sp.	—	t	—	—	—	—	—
Lichen	1	t	9	2	4	12	2
<i>Masonhalea richardsonii</i>	—	t	3	—	—	t	—
<i>Nephroma arcticum</i>	—	t	4	—	—	t	1
<i>Nephroma</i> sp.	11	5	6	—	3	7	2
<i>Parmelia</i> sp.	—	t	—	t	—	—	—
<i>Peltigera canina</i>	6	4	12	—	1	6	3
<i>Peltigera</i> sp.	20	4	13	5	12	8	8
<i>Stereocaulon paschale</i>	—	—	t	—	—	—	—
<i>Stereocaulon</i> sp.	1	9	3	19	3	7	4
Total, lichens	112	95	153	39	39	88	86
% of live phytomass	(0.22)	(0.28)	(1.05)	(0.08)	(0.12)	(0.28)	(0.69)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

Table 12—Aboveground phytomass of mosses, clubmosses, and liverworts on forested vegetation types in the Tanana River basin

Species	Vegetation type and crown-closure percentage						
	Closed needleleaf 60-100	Open needleleaf 25-59	Woodland needleleaf 10-24	All broadleaf 10-100	Closed mixed needlelf./ broadleaf 60-100	Open mixed needlelf./ broadleaf 25-59	All needlelf. dwarf 10-100
<i>Kilograms per hectare</i>							
<i>Aulacomnium</i> sp.	55	31	26	2	2	15	28
<i>Brachythecium</i> sp.	—	—	t <sup>a</sup>	1	3	—	1
<i>Bryum</i> sp.	—	t	1	—	—	—	—
<i>Climaciun dendroides</i>	—	—	t	—	—	—	—
<i>Dicranum</i> sp.	4	10	8	3	7	9	4
<i>Distichium</i> sp.	—	—	1	1	2	—	—
<i>Ditrichum</i> sp.	—	—	—	—	—	8	—
<i>Drepanocladus</i> sp.	—	t	3	—	—	—	—
<i>Fissidens</i> sp.	—	t	—	1	—	—	—
<i>Hepaticae</i>	—	—	t	t	—	—	—
<i>Hylocomium</i> sp.	38	13	—	2	24	19	3
<i>Hylocomium splendens</i>	189	146	109	80	161	200	108
<i>Lycopodium alpinum</i>	—	—	—	—	t	—	—
<i>Lycopodium annotinum</i>	4	t	1	6	7	11	1
<i>Lycopodium complanatum</i>	—	t	—	—	8	2	1
<i>Lycopodium</i> sp.	—	—	t	—	—	t	1
<i>Minium</i> sp.	—	3	t	1	1	—	t
Moss	1	4	10	12	3	8	9
<i>Paludella squarrosa</i>	—	t	—	—	—	4	—
<i>Pleurozium schreberi</i>	49	42	37	9	17	41	32
<i>Polytrichum juniperum</i>	—	—	t	—	—	—	—
<i>Polytrichum</i> sp.	15	11	10	10	10	15	5
<i>Ptilium ciliare</i>	—	t	t	—	—	—	—
<i>Ptilium crista-castrensis</i>	6	—	—	1	—	1	—
<i>Ptilium</i> sp.	—	t	—	—	1	—	—
<i>Rhytidiodelphus triquetrus</i>	—	t	—	1	t	—	—
<i>Rhytidium rugosum</i>	t	4	—	—	t	—	2
<i>Rhytidium</i> sp.	2	—	t	—	—	—	—
<i>Sphagnum</i> sp.	32	64	47	2	22	35	137
<i>Splachnum luteum</i>	—	—	—	—	t	—	—
<i>Thuidium</i> sp.	t	t	—	—	—	—	—
<i>Tomenthypnum nitens</i>	—	t	6	—	—	—	—
<i>Tomenthypnum</i> sp.	1	5	5	—	—	t	5
Total, mosses	396	333	264	132	268	368	337
% of live phytomass	(0.78)	(0.98)	(1.81)	(0.27)	(0.84)	(1.17)	(2.72)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Appendix B:**  
**Phytomass on**  
**General Nonforest**  
**Vegetation Types**

**Table 13—Aboveground phytomass for trees on nonforested vegetation types in the Tanana River basin**

Species	Vegetation type								
	Closed <sup>a</sup> tall <sup>b</sup> shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Larix laricina</i>	—	494	—	48	—	—	—	—	—
<i>Picea glauca</i>	2374	—	52	862	—	—	—	757	—
<i>Picea mariana</i>	183	389	179	665	—	—	290	218	—
Total, needleleaf	2557	883	231	1575	—	—	290	975	—
<i>Betula papyrifera</i>	1047	99	t	t	—	—	4	59	—
<i>Populus balsamifera</i>	722	24	—	—	—	—	—	—	—
<i>Populus tremuloides</i>	t	130	—	39	—	—	—	—	—
<i>Populus trichocarpa</i>	—	—	—	—	—	—	—	—	—
Total, broadleaf	1768	253	t	39	—	—	4	59	—
Total, live trees	4326	1136	231	1614	—	—	294	1034	—
% of phytomass	(37.20)	(14.50)	(5.24)	(40.88)	(0.00)	(0.00)	(11.64)	(25.83)	(0.00)
Total, other plants	7304	6697	4180	2334	592	550	2232	2969	774
Total, all live plants	11 630	7833	4411	3948	592	550	2526	4003	774
Downed trees and logs	—	—	—	—	—	—	—	—	—
Standing dead trees	—	—	80	—	—	—	—	—	—
Total, dead trees	—	—	80	—	—	—	—	—	—
Total, live and dead	11 630	7833	4491	3948	592	550	2526	4003	774

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace amount, under 1 kilogram per hectare.

**Table 14—Aboveground phytomass of alder, birch, and willow shrubs on nonforest vegetation types in the Tanana River basin**

Species	Vegetation type								
	Closed <sup>a</sup> tall shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Alnus crispa</i>	896	241	—	58	—	—	—	—	—
<i>Alnus sinuata</i>	466	317	144	75	—	—	45	483	—
<i>Alnus tenuifolia</i>	599	—	—	—	—	—	—	—	—
<i>Betula glandulosa</i>	347	1363	1253	501	—	—	7	394	—
<i>Betula nana</i>	64	191	477	392	16	—	598	112	—
<i>Betula occidentalis</i>	307	1226	—	40	—	—	—	—	—
<i>Salix alaxensis</i>	332	—	—	—	—	—	—	—	—
<i>Salix arctica</i>	—	—	—	—	1	—	—	—	—
<i>Salix bebbiana</i>	—	14	—	—	—	—	—	—	—
<i>Salix glauca</i>	1069	1202	214	167	—	—	13	—	—
<i>Salix lanata</i>	—	227	—	—	—	—	39	—	—
<i>Salix monticola</i>	—	—	36	15	—	—	—	—	—
<i>Salix myrtillifolia</i>	—	109	2	21	—	—	—	—	—
<i>Salix phlebophylla</i>	—	—	4	—	5	14	—	—	32
<i>Salix planifolia</i>	758	197	198	151	14	—	156	—	144
<i>Salix polaris</i>	—	—	—	—	13	8	—	—	—
<i>Salix reticulata</i>	—	1	8	6	13	17	3	—	16
<i>Salix</i> sp.	664	290	569	29	5	22	66	177	—
Total, tall shrubs	5502	5378	2905	1455	67	61	927	1166	192
% of phytomass	(47.31)	(68.66)	(65.86)	(36.85)	(11.32)	(11.09)	(36.70)	(29.13)	(24.81)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

**Table 15—Aboveground phytomass of other shrubs on nonforest vegetation types in the Tanana River basin**

Species	Vegetation type								
	Closed tall <sup>a</sup> shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Andromedia polifolia</i>	—	—	—	—	—	—	—	9	—
<i>Arctostaphylos alpina</i>	—	—	6	7	—	—	—	—	—
<i>Arctostaphylos rubra</i>	5	—	9	6	1	3	8	—	—
<i>Arctostaphylos uva-ursi</i>	—	—	t	1	—	—	—	—	—
<i>Artemisia</i> sp.	t <sup>c</sup>	—	2	—	—	—	1	—	—
<i>Artemisia arctica</i>	—	—	t	t	t	1	—	—	1
<i>Artemisia tilesii</i>	—	12	—	—	—	—	—	—	—
<i>Cassiope tetragona</i>	—	1	t	—	3	3	3	—	15
<i>Chamaedaphne calyculata</i>	37	8	18	14	—	—	17	8	—
<i>Diapensia lapponica</i>	—	—	—	1	1	3	—	—	8
<i>Dryas octopetala</i>	—	—	—	t	27	15	1	—	—
<i>Dryas</i> sp.	—	—	1	1	—	—	—	—	—
<i>Empetrum nigrum</i>	—	3	20	14	1	3	7	—	20
<i>Juniperus communis</i>	—	2	—	—	—	—	—	—	—
<i>Ledum groenlandicum</i>	179	268	9	85	—	—	—	16	—
<i>Ledum palustre decumbens</i>	64	54	149	31	2	4	91	17	4
<i>Linnaea borealis</i>	5	2	t	1	—	—	—	—	—
<i>Loiseleuria procumbens</i>	—	—	—	—	16	28	2	—	—
<i>Potentilla fruticosa</i>	5	47	43	1	1	—	—	—	—
<i>Rhododendron lapponicum</i>	—	—	—	—	2	—	—	—	—
<i>Rhododendron</i> sp.	—	—	—	—	t	—	—	—	—
<i>Ribes</i> sp.	2	—	—	—	—	—	—	—	—
<i>Ribes triste</i>	25	—	—	—	—	—	—	—	—
<i>Rosa acicularis</i>	30	2	—	t	—	—	—	7	—
<i>Rubus arcticus</i>	3	t	1	t	—	—	—	4	—
<i>Rubus chamaemorus</i>	t	—	t	—	—	—	4	1	—
<i>Rumex arcticus</i>	10	—	1	—	—	—	—	1	—
<i>Shepherdia canadensis</i>	—	11	81	—	—	—	—	—	—
<i>Sorbus scopulina</i>	—	4	—	—	—	—	—	—	—
<i>Spiraea beauverdiana</i>	175	31	3	7	—	—	67	23	9
<i>Vaccinium oxycoccus</i>	1	—	—	—	—	—	—	t	—
<i>Vaccinium vitis-idaea</i>	18	17	9	19	1	3	9	4	2
<i>Vaccinium uliginosum</i>	298	385	258	219	14	8	193	10	10
<i>Viburnum edule</i>	21	—	—	—	—	—	—	1	—
Total, low shrubs	878	847	610	407	69	71	403	101	69
% of phytomass	(7.55)	(10.81)	(13.83)	(10.31)	(11.66)	(12.91)	(15.95)	(2.52)	(8.91)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace amount, under 1 kilogram per hectare.

Table 16—Aboveground phytomass of forbs on nonforest vegetation types in the Tanana River basin

Species	Vegetation type								
	Closed <sup>a</sup> tall <sup>b</sup> shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Achillea</i> sp.	—	—	—	—	—	—	—	—	—
<i>Aconitum delphinifolium</i>	t	—	1	t	1	—	—	—	1
<i>Anemone narcissiflora</i>	—	—	t	1	t	3	—	—	—
<i>Antennaria friesiana</i>	—	—	—	—	1	2	—	—	—
<i>Antennaria</i> sp.	—	—	—	t	—	2	—	—	—
<i>Arabis arenicola</i>	—	—	—	—	1	t	—	—	—
<i>Aster sibiricus</i>	—	—	1	—	—	—	—	—	—
<i>Astragalus</i> sp.	—	—	—	—	t	1	—	—	—
<i>Boykinia richardsonii</i>	—	—	t	—	—	—	—	—	—
<i>Caltha leptosepala</i>	—	—	—	—	—	—	—	24	—
<i>Caltha palustris</i>	27	—	—	—	—	—	—	—	—
<i>Cicuta mackenzieana</i>	49	—	—	—	t	—	—	—	—
<i>Campanula lasiocarpa</i>	—	—	—	—	—	t	—	—	1
<i>Castilleja</i> sp.	—	—	—	—	t	t	—	—	—
<i>Claytonia sarmentosa</i>	—	—	—	t	t	t	—	—	—
<i>Claytonia</i> sp.	—	—	—	t	t	t	—	—	—
<i>Cornus canadensis</i>	—	3	t	1	—	—	1	—	t
<i>Cornus</i> sp.	t	—	—	—	—	—	—	—	—
<i>Dodecatheon frigidum</i>	—	—	—	t	—	—	—	—	—
<i>Dodecatheon</i> sp.	—	—	—	t	—	—	—	—	—
<i>Draba</i> sp.	—	—	—	—	1	—	—	—	—
<i>Epilobium angustifolium</i>	—	9	5	12	—	—	—	—	—
<i>Epilobium latifolium</i>	—	10	t	—	1	10	—	—	4
<i>Epilobium</i> sp.	—	—	—	—	—	2	—	—	—
<i>Equisetum arvense</i>	—	11	t	3	—	—	—	—	—
<i>Equisetum fluviatile</i>	37	—	—	—	—	—	—	—	—
<i>Equisetum palustre</i>	4	t	t	—	—	—	—	—	—
<i>Equisetum pratense</i>	—	t	t	—	—	—	—	—	—
<i>Equisetum scirpoides</i>	—	2	2	t	—	—	—	—	—
<i>Equisetum silvaticum</i>	8	—	—	—	—	—	—	—	—
<i>Equisetum</i> sp.	3	—	—	—	—	—	—	1	—
<i>Erigeron purpuratus</i>	—	—	—	t	—	—	—	—	—
Fern	—	—	t	1	—	—	—	—	—
Forb	—	1	1	1	—	t	—	—	—
<i>Gentiana algida</i>	—	—	—	—	—	—	—	—	—
<i>Gentiana glauca</i>	—	—	—	—	—	—	—	—	—
<i>Gentiana pentapetalum</i>	—	—	—	—	—	—	—	—	3
<i>Gentiana</i> sp.	—	—	—	—	—	—	—	—	—
<i>Geocaulon lividum</i>	—	—	—	t	—	—	—	—	—
<i>Geum rossii</i>	—	—	—	—	—	7	—	—	—
<i>Goodyera repens</i>	—	—	—	—	—	—	—	t	—
<i>Hedysarum</i> sp.	—	1	—	—	—	t <sup>c</sup>	—	—	—
<i>Ligusticum mutellinoides</i>	—	—	—	—	—	—	—	—	—
<i>Lupinus arcticus</i>	—	—	2	1	—	—	—	—	—
<i>Lupinus</i> sp.	—	t	—	—	1	—	—	—	—
<i>Menyanthes trifoliata</i>	—	—	—	—	—	—	25	—	—

**Table 16—Aboveground phytomass of forbs on nonforest vegetation types in the Tanana River basin  
(continued)**

Species	Vegetation type								
	Closed tall <sup>a</sup> shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Mertensia paniculata</i>	—	3	7	1	—	—	—	—	—
<i>Mimulus guttatus</i>	t	—	t	t	t	—	—	—	—
Mushroom	t	t	—	—	1	—	—	—	—
<i>Mysotis alpestris</i>	—	—	—	—	—	—	—	—	—
<i>Nuphar</i> sp.	13	—	—	—	—	—	—	—	—
Other unidentified	9	8	3	5	4	—	8	—	—
<i>Oxyria digyna</i>	—	—	—	—	4	—	—	—	—
<i>Oxytropis</i> sp.	—	—	—	—	t	—	—	—	—
<i>Parnassia palustris</i>	—	—	t	—	—	1	—	—	—
<i>Pedicularis kanei</i>	—	—	—	t	t	t	—	—	—
<i>Pedicularis capitata</i>	—	—	—	—	t	t	—	—	—
<i>Pedicularis labradorica</i>	—	—	—	—	t	—	—	—	—
<i>Pedicularis</i> sp.	—	—	1	—	t	—	—	—	—
<i>Petasites frigidus</i>	17	10	t	4	—	—	2	—	—
<i>Petasites hyperboreus</i>	5	—	4	t	t	—	—	—	—
<i>Petasites sagittatus</i>	—	—	—	—	—	—	—	7	—
<i>Petasites</i> sp.	—	—	1	—	2	—	—	—	—
<i>Polemonium acutiflorum</i>	—	—	2	t	—	—	—	—	—
<i>Polemonium</i> sp.	6	t	1	—	—	—	—	—	—
<i>Polygonum bistorta</i>	—	—	—	t	3	—	—	—	—
<i>Polygonum</i> sp.	—	—	—	—	—	—	—	—	—
<i>Polygonum vivparum</i>	—	—	—	—	1	2	—	—	—
<i>Potentilla palustris</i>	10	10	—	t	—	—	201	189	—
<i>Potentilla</i> sp.	1	—	1	—	—	—	—	—	—
<i>Primula tschuktschorum</i>	—	—	—	—	—	—	—	—	—
<i>Pyrola asarifolia</i>	4	—	—	—	—	—	—	—	—
<i>Pyrola grandiflora</i>	7	—	—	—	—	t	—	—	—
<i>Pyrola</i> sp.	1	—	1	—	—	—	1	—	t
<i>Ranunculus lapponicus</i>	2	—	—	—	—	—	—	—	—
<i>Ranunculus</i> sp.	—	1	1	1	t	14	—	—	4
<i>Rumex</i> sp.	12	—	3	—	—	—	—	—	—
<i>Saussurea angustifolia</i>	—	—	t	2	1	—	—	—	—
<i>Saxifraga bronchialis</i>	—	—	—	—	t	—	—	—	—
<i>Saxifraga davurica</i>	—	—	—	—	t	—	—	—	—
<i>Saxifraga hieracifolia</i>	—	—	—	—	2	—	—	—	—
<i>Saxifraga punctata</i>	—	—	—	—	t	—	—	—	—
<i>Saxifraga serpyllifolia</i>	—	—	—	—	—	1	—	—	—
<i>Saxifraga</i> sp.	—	—	5	—	2	t <sup>c</sup>	—	—	8
<i>Saxifraga tricuspidata</i>	—	—	t	1	—	1	—	—	—
<i>Sedum rosea</i>	1	—	1	—	t	—	—	—	—
<i>Senecio fuscatus</i>	—	—	—	—	t	—	—	—	—
<i>Senecio lugens</i>	—	—	—	—	t	—	—	—	—
<i>Senecio</i> sp.	—	—	2	t	t	—	t	—	—
<i>Senecio triangularis</i>	—	—	t	—	—	—	—	—	—
<i>Sibbaldia procumbens</i>	—	—	—	—	—	t	—	—	—

Table 16—Aboveground phytomass of forbs on nonforest vegetation types in the Tanana River basin  
(continued)

Species	Vegetation type								
	Closed <sup>a</sup> tall <sup>b</sup> shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Silene acaulis</i>	—	—	—	—	1	t	1	—	—
<i>Solidago multiradiata</i>	—	—	1	—	—	—	—	—	—
<i>Spiranthes romanzoffiana</i>	—	—	—	t	—	—	—	—	—
<i>Stellaria</i> sp.	1	—	t	t	t	—	—	—	—
<i>Taraxacum</i> sp.	—	—	—	—	—	t	—	—	—
<i>Thalictrum</i> sp.	—	—	t	t	—	—	—	—	—
<i>Tofieldia pusilla</i>	—	—	—	—	—	t	—	—	—
<i>Trientalis europaea</i>	—	t	—	—	—	—	—	—	—
<i>Typha</i> sp.	—	—	—	—	—	—	4	—	—
<i>Valeriana capitata</i>	t	—	1	1	t	—	—	—	—
<i>Viola epipsila</i>	1	—	—	—	—	—	—	—	—
<i>Viola</i> sp.	—	—	t	—	—	—	—	—	—
Total, forbs	218	69	47	39	32	41	244	221	21
% of phytomass	(1.87)	(0.88)	(1.07)	(0.99)	(5.41)	(7.45)	(9.66)	(5.52)	(2.71)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 17—Aboveground phytomass of grass and grasslike species on nonforest vegetation types in the Tanana River basin**

Species	Vegetation type								
	Closed <sup>a</sup> tall <sup>b</sup> shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Calamagrostis canadensis</i>	381	90	38	23	—	—	161	252	—
<i>Calamagrostis</i> sp.	—	—	—	t <sup>c</sup>	—	—	—	—	—
<i>Carex aquatilis</i>	—	—	25	—	—	—	—	279	—
<i>Carex</i> sp.	38	31	144	45	45	20	207	802	43
<i>Eriophorum</i> sp.	—	—	—	—	2	—	—	57	—
<i>Festuca altaica</i>	—	—	4	7	2	3	—	—	—
<i>Festuca</i> sp.	—	—	11	—	—	—	—	—	—
Grass	19	28	17	15	8	—	11	11	7
<i>Glyceria</i> sp.	17	—	—	—	—	—	—	—	—
<i>Hierochloe alpina</i>	—	—	2	2	21	7	—	—	12
<i>Juncus</i> sp.	—	—	—	—	t	—	—	—	—
<i>Poa</i> sp.	—	—	—	—	—	3	—	—	—
<i>Trisetum spicatum</i>	—	—	—	—	—	5	—	—	—
Total, grasses	455	149	241	92	78	38	379	1401	62
% of phytomass	(3.91)	(1.90)	(5.46)	(2.33)	(13.18)	(6.91)	(15.00)	(35.00)	(8.01)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

Table 18—Aboveground phytomass of lichens on nonforest vegetation types in the Tanana River basin

Species	Vegetation type								
	Closed <sup>a</sup> tall <sup>b</sup> shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Cetraria cucullata</i>	—	—	1	13	3	6	20	t <sup>c</sup>	—
<i>Cetraria islandica</i>	—	—	4	2	—	3	1	—	14
<i>Cetraria nivalis</i>	—	—	t	1	7	12	2	—	—
<i>Cetraria</i> sp.	1	9	—	3	—	—	14	—	—
<i>Cladina alpestris</i>	—	—	—	—	—	—	—	—	70
<i>Cladina raniferina</i>	—	—	—	—	—	—	—	—	—
<i>Cladina</i> sp.	—	8	19	12	22	130	—	1	33
<i>Cladonia mitis</i>	—	—	—	1	—	—	7	—	—
<i>Cladonia</i> sp.	1	6	5	8	24	15	7	t	6
<i>Dactylina arctica</i>	—	—	—	—	1	1	—	—	11
<i>Dactylina</i> sp.	—	—	—	—	—	—	1	—	—
Lichen	4	—	4	31	44	25	—	1	139
<i>Masonhalea richardsonii</i>	—	—	4	4	6	3	—	—	2
<i>Nephroma arcticum</i>	—	—	2	1	—	—	—	—	12
<i>Nephroma</i> sp.	—	—	—	—	—	—	2	t	—
<i>Parmelia</i> sp.	1	—	—	—	—	—	—	—	—
<i>Peltigera canina</i>	—	5	7	2	—	1	—	1	—
<i>Peltigera</i> sp.	3	41	12	16	4	2	4	—	—
<i>Stereocaulon</i> sp.	—	3	35	28	9	12	—	—	71
Total, lichens	10	72	93	122	120	210	58	3	358
% of phytomass	(0.09)	(0.92)	(2.11)	(3.09)	(20.27)	(38.18)	(2.30)	(0.07)	(46.25)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

Table 19—Aboveground phytomass of mosses and clubmosses on nonforest vegetation types in the Tanana River basin

Species	Vegetation type								
	Closed <sup>a</sup> tall <sup>b</sup> shrub	Open tall shrub	Closed low shrub	Open low shrub	Closed dwarf scrub	Open dwarf scrub	Mesic gram. herb.	Wet gram. herb.	Dry forb herb.
<i>Kilograms per hectare</i>									
<i>Aulacomnium</i> sp.	20	20	20	48	42	14	29	1	21
<i>Brachythecium</i> sp.	4	t <sup>c</sup>	6	—	—	—	—	9	2
<i>Dicranum</i> sp.	6	2	14	2	44	14	22	—	—
<i>Drepanocladus</i> sp.	—	—	—	—	—	1	—	—	—
<i>Hylocomium</i> sp.	5	65	4	—	—	—	55	—	—
<i>Hylocomium splendens</i>	78	35	111	71	23	—	—	—	—
<i>Lycopodium alpinum</i>	9	—	—	—	—	—	—	—	—
<i>Lycopodium annotinum</i>	—	7	t	—	—	—	—	—	—
<i>Lycopodium complanatum</i>	2	1	—	—	—	—	—	—	—
<i>Lycopodium selago</i>	—	—	—	—	t	—	—	—	—
<i>Lycopodium</i> sp.	3	—	—	—	—	—	—	—	—
<i>Minium</i> sp.	t	t	2	—	—	2	—	—	—
Moss	12	10	9	15	20	18	—	12	27
<i>Paludella squarrosa</i>	—	—	—	—	—	—	9	4	—
<i>Pleurozium schreberi</i>	47	9	41	35	3	9	—	—	—
<i>Polytrichum juniperum</i>	—	—	—	—	—	—	14	t	—
<i>Polytrichum</i> sp.	6	15	14	12	50	30	—	—	22
<i>Ptilium crista-castrensis</i>	—	—	1	2	—	—	—	—	—
<i>Ptilium</i> sp.	—	—	—	—	—	—	—	2	—
<i>Rhacomitrium lanuginosum</i>	—	—	1	6	—	9	—	—	—
<i>Rhacomitrium</i> sp.	—	—	—	2	12	32	—	—	—
<i>Rhytidium rugosum</i>	—	—	—	—	t	—	—	—	—
<i>Rhytidium</i> sp.	—	—	4	—	—	—	—	—	—
<i>Sphagnum</i> sp.	48	19	56	23	—	—	87	49	—
<i>Tomentypnum nitens</i>	—	—	—	1	30	—	—	—	—
<i>Tomentypnum</i> sp.	—	t	1	2	2	—	5	—	—
Total, mosses	240	183	284	219	226	129	221	77	72
% of phytomass	(2.06)	(2.34)	(6.44)	(5.55)	(38.18)	(23.45)	(8.75)	(1.92)	(9.30)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

## Appendix C: Phytomass on Needleleaf Forest Vegetation Types

Table 20—Aboveground phytomass of trees on forested needleleaf vegetation types in the Tanana River basin

Species	Vegetation type					
	Closed needleleaf white spruce	Closed needleleaf black spruce	Closed needleleaf tamarack/ spruce	Open needleleaf white spruce	Open needleleaf mixed spruces	Open needleleaf black spruce
<i>Kilograms per hectare</i>						
<i>Larix laricina</i>	—	1745	9178	—	—	146
<i>Picea glauca</i>	139 603	2399	—	36 365	11 502	3882
<i>Picea mariana</i>	—	36 275	7735	1686	4609	23 248
Total, needleleaf	139 603	40 419	16 913	38 051	16 111	27 275
<i>Betula papyrifera</i>	—	856	3172	1902	—	1584
<i>Populus balsamifera</i>	—	—	—	t <sup>a</sup>	—	—
<i>Populus tremuloides</i>	—	—	798	22	—	2
<i>Populus trichocarpa</i>	8629	—	—	—	—	—
Total, broadleaf	8629	856	3969	1924	—	1586
Total, all live trees	148 232	41 275	20 882	39 975	16 111	28 861
% of live phytomass	(98.86)	(94.23)	(77.92)	(89.21)	(77.67)	(88.28)
Total, other plants	1703	2529	5916	4834	4632	3831
Total, all live plants	149 935	43 804	26 798	44 809	20 743	32 692
Downed trees and logs	3754	1163	—	1721	—	93
Standing dead trees	10 197	2103	—	2441	119	885
Total, dead trees	13 951	3266	—	4162	119	978
Total, live and dead	163 886	47 070	26 798	48 971	20 862	33 670

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 21—Aboveground phytomass of alder, birch, and willow shrubs on forested needleleaf vegetation types in the Tanana River basin**

Species	Vegetation type					
	Closed needleleaf white spruce	Closed needleleaf black spruce	Closed needleleaf tamarack/ spruce	Open needleleaf white spruce	Open needleleaf mixed spruces	Open needleleaf black spruce
<i>Kilograms per hectare</i>						
<i>Alnus crispa</i>	—	431	—	1584	2020	385
<i>Alnus tenuifolia</i>	—	—	—	—	—	131
<i>Alnus sinuata</i>	954	—	—	387	—	21
<i>Betula nana</i>	—	36	—	178	4	266
<i>Betula glandulosa</i>	—	134	—	455	246	742
<i>Betula occidentalis</i>	—	—	—	21	—	—
<i>Salix alaxensis</i>	—	31	—	21	23	—
<i>Salix interior</i>	—	—	—	84	—	—
<i>Salix</i> sp.	19	150	—	542	898	355
<i>Salix bebbiana</i>	—	36	—	—	—	15
<i>Salix arbusculoides</i>	—	3	—	—	—	—
<i>Salix lanata</i>	—	—	—	8	—	—
<i>Salix glauca</i>	—	19	5084	—	—	133
<i>Salix reticulata</i>	—	—	—	8	1	—
<i>Salix planifolia</i>	—	99	—	—	—	26
<i>Salix myrtillifolia</i>	—	—	—	6	—	48
<i>Salix monticola</i>	—	—	—	—	—	—
Total, tall shrubs	973	939	5084	3294	3192	2122
% of phytomass	(0.65)	(2.15)	(18.97)	(7.35)	(15.39)	(6.49)

— = plant not sampled in this type.

Table 22—Aboveground phytomass of other shrubs on forested needleleaf vegetation types in the Tanana River basin

Species	Vegetation type					
	Closed needleleaf white spruce	Closed needleleaf black spruce	Closed needleleaf tamarack/ spruce	Open needleleaf white spruce	Open needleleaf mixed spruces	Open needleleaf black spruce
<i>Kilograms per hectare</i>						
<i>Andromeda polifolia</i>	—	—	—	—	—	10
<i>Arctostaphylos rubra</i>	—	2	—	17	34	21
<i>Cassiope tetragona</i>	—	—	—	16	8	—
<i>Chamaedaphne calyculata</i>	—	14	—	1	—	14
<i>Dryas octopetala</i>	—	—	—	6	13	—
<i>Dryas integrifolia</i>	—	—	—	1	—	—
<i>Dryas</i> sp.	—	—	—	1	—	—
<i>Empetrum nigrum</i>	—	7	—	12	64	9
<i>Juniperus communis</i>	—	—	—	10	—	—
<i>Ledum groenlandicum</i>	—	532	294	16	158	320
<i>Ledum palustre decumbens</i>	—	61	—	105	—	102
<i>Linnaea borealis</i>	4	2	—	4	—	1
<i>Myrica gale</i>	—	—	—	—	—	15
<i>Potentilla fruticosa</i>	—	2	—	52	—	16
<i>Ribes triste</i>	—	—	—	7	—	1
<i>Ribes</i> sp.	—	—	—	3	—	2
<i>Ribes hudsonianum</i>	—	2	—	—	—	—
<i>Rosa acicularis</i>	50	13	2	46	—	7
<i>Rubus arcticus</i>	3	—	—	2	—	t <sup>a</sup>
<i>Rubus pedatus</i>	—	—	—	—	—	t
<i>Rubus chamaemorus</i>	1	5	—	1	1	4
<i>Rubus</i> sp.	—	t	—	—	—	—
<i>Shepherdia canadensis</i>	22	—	—	8	—	—
<i>Spiraea beauverdiana</i>	—	10	—	31	6	42
<i>Vaccinium oxycoccus</i>	—	—	—	—	—	1
<i>Vaccinium vitis-idaea</i>	33	71	25	17	45	39
<i>Vaccinium uliginosum</i>	—	283	109	479	538	401
<i>Viburnum edule</i>	3	—	—	34	—	—
Total, low shrubs	116	1004	430	869	867	1005
% of phytomass	(0.08)	(2.29)	(1.61)	(1.94)	(4.18)	(3.08)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 23—Aboveground phytomass of forbs on forested needleleaf vegetation types in the Tanana River basin**

Species	Vegetation type					
	Closed needleleaf white spruce	Closed needleleaf black spruce	Closed needleleaf tamarack/ spruce	Open needleleaf white spruce	Open needleleaf mixed spruces	Open needleleaf black spruce
<i>Kilograms per hectare</i>						
<i>Aconitum delphinifolium</i>	—	—	—	t <sup>a</sup>	—	—
<i>Anemone richardsonii</i>	—	—	—	t	—	—
<i>Anemone</i> sp.	1	—	—	t	—	—
<i>Boschniakia rossica</i>	—	—	—	t	—	—
<i>Boykinia richardsonii</i>	—	—	—	5	—	—
<i>Cardamine</i> sp.	—	—	—	t	—	—
<i>Compositae</i> family	—	—	—	1	—	—
<i>Cornus canadensis</i>	4	1	—	8	—	2
<i>Delphinium brachycentrum</i>	—	—	—	t	—	—
<i>Dodecatheon</i> sp.	—	—	—	t	—	—
<i>Epilobium</i> sp.	—	t	—	—	—	—
<i>Epilobium angustifolium</i>	1	—	13	4	—	5
<i>Epilobium latifolium</i>	—	—	—	1	—	—
<i>Equisetum sylvaticum</i>	—	18	—	16	21	25
<i>Equisetum scirpoides</i>	—	1	—	t	—	3
<i>Equisetum</i> sp.	—	t	—	6	1	1
<i>Equisetum arvense</i>	56	2	24	15	4	1
<i>Equisetum pratense</i>	—	1	—	6	—	t
<i>Equisetum palustre</i>	—	—	—	—	—	1
Forb	—	—	—	t	4	t
<i>Galium</i> sp.	—	—	—	t	—	—
<i>Geocaulon lividum</i>	8	5	—	7	—	6
<i>Gymnocarpium dryopteris</i>	—	—	—	t	—	—
<i>Hedysarum</i>	—	—	—	1	—	—
<i>Iris</i> sp.	—	—	—	1	—	—
<i>Lupinus arcticus</i>	—	—	—	3	—	—
<i>Mertensia paniculata</i>	—	1	—	2	t	1
Mushroom	t	t	—	t	—	t
Other unidentified	—	4	36	11	—	7
<i>Papaver macounii</i>	—	—	—	t	—	—
<i>Parnassia palustris</i>	—	—	—	2	—	—
<i>Pedicularis</i> sp.	—	—	—	t	—	t
<i>Pedicularis capitata</i>	—	—	—	t	—	—
<i>Petasites hyperboreus</i>	—	6	—	5	16	2
<i>Petasites frigidus</i>	—	1	—	2	—	t
<i>Petasites</i> sp.	—	—	—	t	—	1
<i>Polemonium acutiflorum</i>	—	—	—	—	—	t
<i>Polygonum alaskanum</i>	—	2	—	—	—	6
<i>Polygonum bistorta</i>	—	—	—	t	—	—
<i>Potentilla palustris</i>	—	—	—	—	—	9
<i>Potentilla norvegica</i>	—	—	—	—	—	68
<i>Pyrola</i> sp.	3	—	—	1	—	1
<i>Pyrola secunda</i>	6	—	—	t	—	—
<i>Pyrola grandiflora</i>	—	—	—	t	—	—

Table 23—Aboveground phytomass of forbs on forested needleleaf vegetation types in the Tanana River basin (continued)

Species	Vegetation type					
	Closed needleleaf white spruce	Closed needleleaf black spruce	Closed needleleaf tamarack/ spruce	Open needleleaf white spruce	Open needleleaf mixed spruces	Open needleleaf black spruce
<i>Kilograms per hectare</i>						
<i>Ranunculus</i> sp.	—	—	—	3	—	—
<i>Sanguisorba</i> sp.	—	—	—	—	—	t
<i>Saussurea angustifolia</i>	—	—	—	2	1	1
<i>Saxifraga tricuspidata</i>	—	—	—	t	—	—
<i>Saxifraga</i> sp.	—	—	—	—	—	t
<i>Saxifraga bronchialis</i>	—	—	—	3	—	—
<i>Saxifraga hieracifolia</i>	—	—	—	—	—	t
<i>Solidago spathulata</i>	—	—	—	t	—	—
<i>Spiranthes romanzoffiana</i>	1	—	—	t	—	—
<i>Stellaria</i> sp.	—	—	—	t	—	t
<i>Stellaria calycantha</i>	—	—	—	—	t	t
<i>Tofieldia</i> sp.	—	—	—	t	—	—
<i>Valeriana capitata</i>	—	—	—	t	—	—
<i>Viola</i> sp.	—	—	—	t	—	1
<i>Woodsia alpina</i>	—	—	—	t	—	—
Total, forbs	80	42	73	105	47	141
% of phytomass	(0.05)	(0.10)	(0.27)	(0.23)	(0.23)	(0.43)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 24—Aboveground phytomass of grass and grasslike species on forested needleleaf vegetation types in the Tanana River basin**

Species	Vegetation type					
	Closed needleleaf white spruce	Closed needleleaf black spruce	Closed needleleaf tamarack/ spruce	Open needleleaf white spruce	Open needleleaf mixed spruces	Open needleleaf black spruce
<i>Kilograms per hectare</i>						
<i>Calamagrostis canadensis</i>	—	—	—	66	14	56
<i>Calamagrostis</i> sp.	—	7	—	—	—	—
<i>Carex rostrata</i>	—	—	—	—	—	16
<i>Carex</i> sp.	—	3	—	16	55	34
<i>Eriophorum</i> sp.	—	—	—	—	—	1
<i>Festuca altaica</i>	—	—	—	3	—	—
Grass	2	13	—	13	16	10
Total, grasses	2	23	—	98	85	117
% of phytomass	(0.01)	(0.05)	(0.00)	(0.22)	(0.41)	(0.36)

— = plant not sampled in this type.

Table 25—Aboveground phytomass of lichens on forested needleleaf vegetation types in the Tanana River basin

Species	Vegetation type					
	Closed needleleaf white spruce	Closed needleleaf black spruce	Closed needleleaf tamarack/ spruce	Open needleleaf white spruce	Open needleleaf mixed spruces	Open needleleaf black spruce
Kilograms per hectare						
<i>Cetraria cucullata</i>	—	2	—	6	5	4
<i>Cetraria islandica</i>	—	1	—	5	t <sup>a</sup>	1
<i>Cetraria nivalis</i>	—	—	—	1	—	—
<i>Cetraria</i> sp.	—	—	8	—	—	1
<i>Cladina alpestris</i>	—	8	—	—	—	1
<i>Cladina mitis</i>	—	13	—	—	—	9
<i>Cladina rangiferina</i>	—	2	—	—	—	—
<i>Cladina</i> sp.	—	53	—	37	7	59
<i>Cladonia coccifera</i>	—	—	—	t	—	—
<i>Cladonia</i> sp.	6	6	4	10	3	13
<i>Dactylina arctica</i>	—	—	—	1	1	—
Lichen	—	1	—	—	5	1
<i>Masonhalea richardsonii</i>	—	—	—	6	—	t
<i>Nephroma arcticum</i>	—	—	—	—	—	2
<i>Nephroma</i> sp.	—	12	—	2	—	6
<i>Parmelia</i> sp.	—	—	—	—	—	t
<i>Peltigera canina</i>	—	7	—	3	—	4
<i>Peltigera</i> sp.	10	13	110	6	2	5
<i>Polyblastia</i>	—	—	—	—	—	t
<i>Stereocaulon</i> sp.	—	1	2	24	t	—
Total, lichens	16	119	124	101	23	106
% of phytomass	(0.01)	(0.27)	(0.46)	(0.23)	(0.11)	(0.32)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 26—Aboveground phytomass of mosses and clubmosses on forested needleleaf vegetation types in the Tanana River basin**

Species	Vegetation type					
	Closed needleleaf white spruce	Closed needleleaf black spruce	Closed needleleaf tamarack/ spruce	Open needleleaf white spruce	Open needleleaf mixed spruces	Open needleleaf black spruce
<i>Kilograms per hectare</i>						
<i>Aulacomnium</i> sp.	—	47	203	4	48	47
<i>Brachythecium</i> sp.	—	—	—	t <sup>a</sup>	—	—
<i>Bryum</i> sp.	—	—	—	—	1	—
<i>Dicranum</i> sp.	—	5	—	28	1	6
<i>Distichium</i> sp.	—	—	—	3	—	1
<i>Drepanocladus</i> sp.	—	—	—	1	—	—
<i>Fissidens</i> sp.	—	—	—	2	—	—
<i>Hylocomium</i> sp.	—	45	—	—	2	18
<i>Hylocomium splendens</i>	468	181	—	258	210	107
<i>Lycopodium annotinum</i>	—	4	—	1	—	1
<i>Lycopodium complanatum</i>	—	—	—	—	—	1
<i>Lycopodium</i> sp.	—	—	—	—	—	1
<i>Minium</i> sp.	—	—	—	1	—	3
Moss	—	1	—	4	8	3
<i>Paludella squarrosa</i>	—	—	—	—	—	t
<i>Pleurozium schreberi</i>	—	58	—	14	79	51
<i>Polytrichum</i> sp.	—	17	—	6	8	12
<i>Ptilium ciliare</i>	—	—	—	—	—	t
<i>Ptilium crista-castrensis</i>	40	4	—	—	—	—
<i>Ptilium</i> sp.	—	—	—	1	—	—
<i>Rhytidadelphus triquetrus</i>	—	—	—	3	—	—
<i>Rhytidium rugosum</i>	—	t	—	15	—	1
<i>Rhytidium</i> sp.	—	2	—	—	—	—
<i>Sphagnum</i> sp.	—	38	—	14	61	81
<i>Thuidium</i> sp.	—	t	—	—	—	1
<i>Tomenthypnum nitens</i>	—	—	—	—	—	t
<i>Tomenthypnum</i> sp.	7	—	—	12	—	4
Total, mosses	515	402	203	367	418	338
% of phytomass	(0.34)	(0.92)	(0.76)	(0.82)	(2.02)	(1.03)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Appendix D:**  
**Phytomass on**  
**Mixed Needleleaf**  
**Woodland and**  
**Broadleaf Forest**  
**Vegetation Types**

**Table 27—Aboveground phytomass of trees on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin**

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Larix laricina</i>	—	588	—	5	—	—	—
<i>Picea glauca</i>	14 431	1190	2136	5756	11 015	—	63
<i>Picea mariana</i>	57	6052	3944	4551	—	—	—
Total, needleleaf	14 488	7830	6080	10 312	11 015	—	63
<i>Betula papyrifera</i>	—	112	—	26 807	6163	7174	—
<i>Populus balsamifera</i>	—	14	—	—	1728	—	1791
<i>Populus tremuloides</i>	46	3	4703	934	55 444	—	—
<i>Populus trichocarpa</i>	—	—	—	—	—	—	—
Total, broadleaf	46	129	4703	27 741	63 335	7174	1791
Total, live trees	14 534	7959	10 783	38 053	74 350	7174	1854
% of live phytomass	(80.98)	(67.32)	(69.70)	(86.64)	(96.00)	(38.74)	(72.06)
Total, other plants	3413	3863	4687	5869	3098	11 346	719
Total, live plants	17 947	11 822	15 470	43 922	77 448	18 520	2573
Downed trees and logs	239	—	—	276	—	—	—
Standing dead trees	574	—	—	2165	—	—	—
Total, dead trees	813	—	—	2441	—	—	—
Total, live and dead	18 760	11 822	15 470	46 363	77 448	18 520	2573

— = plant not sampled in this type.

**Table 28—Aboveground phytomass of alder, birch, and willow shrubs on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin**

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Alnus crispa</i>	114	—	—	3231	1196	—	—
<i>Alnus tenuifolia</i>	—	40	—	—	—	—	—
<i>Alnus sinuata</i>	—	1	—	—	—	—	—
<i>Betula nana</i>	484	241	—	—	—	—	—
<i>Betula glandulosa</i>	248	1457	2601	—	60	2459	—
<i>Betula occidentalis</i>	185	—	163	—	—	4466	—
<i>Salix alaxensis</i>	188	—	—	—	—	—	—
<i>Salix</i> sp.	411	271	102	545	687	—	48
<i>Salix bebbiana</i>	—	—	—	2	—	—	—
<i>Salix arbusculoides</i>	—	28	—	—	—	—	—
<i>Salix glauca</i>	272	221	416	522	—	3005	—
<i>Salix reticulata</i>	10	—	—	—	—	—	—
<i>Salix planifolia</i>	26	180	210	406	—	—	—
<i>Salix myrtillifolia</i>	—	1	—	—	—	—	—
<i>Salix monticola</i>	52	12	—	—	—	—	—
Total	1990	2452	3492	4706	1943	9930	48
% of phytomass	(11.09)	(20.74)	(22.57)	(10.71)	(2.50)	(53.62)	(1.87)

— = plant not sampled in this type.

**Table 29—Aboveground phytomass of other shrubs on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin**

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Andromeda polifolia</i>	—	4	—	—	—	—	—
<i>Arctostaphylos uva-ursi</i>	1	—	6	—	28	—	—
<i>Arctostaphylos rubra</i>	27	5	26	—	—	—	—
<i>Cassiope tetragona</i>	4	—	—	—	—	—	—
<i>Chamaedaphne calyculata</i>	—	38	—	—	—	—	—
<i>Dryas octopetala</i>	2	—	—	—	—	—	—
<i>Dryas</i> sp.	10	—	—	—	—	—	164
<i>Empetrum nigrum</i>	35	7	12	—	3	—	—
<i>Juniperus communis</i>	—	—	—	—	19	—	20
<i>Ledum groenlandicum</i>	162	285	175	138	30	693	—
<i>Ledum palustre decumbens</i>	46	66	75	12	—	248	—
<i>Linnaea borealis</i>	4	—	—	—	17	—	—
<i>Myrica gale</i>	—	15	—	—	—	—	—
<i>Potentilla fruticosa</i>	104	—	3	—	2	—	—
<i>Ribes triste</i>	—	—	—	7	—	—	—
<i>Rosa acicularis</i>	2	8	8	170	150	17	—
<i>Rubus arcticus</i>	—	t <sup>a</sup>	—	1	—	—	—
<i>Rubus idaeus</i>	—	—	—	t	—	—	—
<i>Rubus chamaemorus</i>	t	7	1	1	—	—	—
<i>Rubus spectabilis</i>	—	—	—	t	—	—	—
<i>Shepherdia canadensis</i>	—	—	5	—	43	—	—
<i>Spiraea Beauverdiana</i>	—	29	—	60	—	16	—
<i>Vaccinium oxycoccus</i>	—	1	—	—	—	—	—
<i>Vaccinium vitis-idaea</i>	22	27	19	27	23	110	—
<i>Vaccinium uliginosum</i>	456	281	346	122	5	—	—
<i>Viburnum edule</i>	—	—	—	150	621	—	—
Total, other shrubs	875	773	676	688	941	1084	184
% of phytomass	(4.87)	(6.54)	(4.37)	(1.57)	(1.22)	(5.85)	(7.15)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 30—Aboveground phytomass of forbs on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin**

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Achillea</i> sp.	—	—	—	—	t <sup>a</sup>	—	—
<i>Aconitum delphinifolium</i>	—	—	—	—	t	—	—
<i>Actaea rubra</i>	—	—	—	—	1	—	—
<i>Anemone richardsonii</i>	—	—	—	—	—	—	—
<i>Anemone</i> sp.	—	—	—	—	—	—	—
<i>Aster</i> sp.	—	—	—	—	—	—	—
<i>Astragalus</i> sp.	—	—	—	—	—	—	28
<i>Boschniakia rossica</i>	—	—	—	—	—	—	—
<i>Boykinia Richardsonii</i>	—	—	—	—	—	—	—
<i>Campanula aurita</i>	—	—	—	—	—	—	—
<i>Cardamine</i> sp.	t	—	—	—	—	—	—
<i>Castilleja</i> sp.	—	—	—	—	—	—	—
<i>Compositae family</i>	—	—	—	—	—	—	—
<i>Cornus canadensis</i>	1	2	t	3	7	—	—
<i>Delphinium brachycentrum</i>	—	—	—	—	—	—	—
<i>Dodecatheon</i> sp.	—	—	—	—	—	—	—
<i>Epilobium</i> sp.	—	—	—	—	—	—	—
<i>Epilobium angustifolium</i>	1	8	—	50	21	24	—
<i>Epilobium latifolium</i>	1	—	—	—	—	—	—
<i>Equisetum sylvaticum</i>	1	12	—	42	—	—	—
<i>Equisetum scirpoideum</i>	1	7	10	1	3	—	—
<i>Equisetum</i> sp.	—	—	1	—	—	—	—
<i>Equisetum arvense</i>	1	t	—	7	—	—	—
<i>Equisetum pratense</i>	1	—	t	1	1	—	—
<i>Equisetum palustre</i>	—	—	—	5	—	—	—
Fern	—	—	—	—	—	—	—
Forb	1	—	—	—	t	—	—
<i>Fragaria virginiana</i>	—	—	—	—	—	—	—
<i>Galium</i> sp.	—	—	—	3	3	—	—
<i>Galium boreale</i>	—	—	—	1	—	—	—
<i>Geocaulon lividum</i>	1	—	—	—	5	—	—
<i>Goodyera repens</i>	—	—	—	—	—	—	—
<i>Gymnocarpium dryopteris</i>	—	—	—	—	4	—	—
<i>Hedysarum</i>	11	—	—	—	—	—	—
<i>Iris</i> sp.	—	—	—	—	—	—	—
<i>Lupinus</i> sp.	4	—	8	—	1	—	—
<i>Lupinus arcticus</i>	—	—	—	—	1	—	—
<i>Lupinus nootkatensis</i>	—	—	—	—	—	—	—
<i>Mertensia paniculata</i>	1	t	1	8	3	7	—
<i>Moneses uniflora</i>	—	1	—	—	—	—	—
Mushroom	t	t	t	t	t	—	t
Other unidentified	7	13	—	7	t	—	—

Table 30—Aboveground phytomass of forbs on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin (continued)

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Papaver macounii</i>	—	—	—	—	—	—	—
<i>Papaver lapponicum</i>	t	—	—	—	—	—	—
<i>Parnassia palustris</i>	1	—	—	—	—	—	—
<i>Pedicularis</i> sp.	2	—	—	—	—	—	—
<i>Pedicularis labradorica</i>	—	—	—	—	—	—	—
<i>Pedicularis capitata</i>	—	—	—	—	—	—	—
<i>Petasites hyperboreus</i>	—	6	—	t	—	—	—
<i>Petasites frigidus</i>	—	—	4	—	—	—	—
<i>Petasites</i> sp.	—	—	—	—	—	—	—
<i>Polemonium</i> sp.	—	—	—	—	—	—	—
<i>Polemonium acutiflorum</i>	3	t	—	—	—	—	—
<i>Polygonum alaskanum</i>	—	—	—	9	—	—	—
<i>Polygonum</i> sp.	—	—	—	—	—	19	—
<i>Polygonum bistorta</i>	—	—	—	—	—	—	—
<i>Potentilla palustris</i>	—	—	—	—	—	—	—
<i>Potentilla norvegica</i>	—	—	—	—	—	—	—
<i>Pyrola</i> sp.	—	1	t	4	t	—	—
<i>Pyrola secunda</i>	—	—	—	—	—	—	—
<i>Pyrola minor</i>	—	—	—	—	—	—	—
<i>Pyrola asarifolia</i>	—	—	—	—	1	—	—
<i>Pyrola grandiflora</i>	—	—	—	—	2	—	—
<i>Ranunculus</i> sp.	—	—	—	—	—	—	—
<i>Rumex</i> sp.	—	1	—	—	3	—	—
<i>Sanguisorba</i> sp.	—	—	—	—	—	—	—
<i>Saussurea angustifolia</i>	—	—	—	—	—	—	—
<i>Saxifraga tricuspidata</i>	4	—	—	—	—	—	—
<i>Saxifraga</i> sp.	—	t	—	—	—	—	—
<i>Saxifraga bronchialis</i>	—	—	—	—	—	—	—
<i>Saxifraga hieracifolia</i>	—	—	—	—	—	—	—
<i>Smilacina stellata</i>	—	—	—	—	—	—	—
<i>Solidago spathulata</i>	—	—	—	—	—	—	—
<i>Solidago multiradiata</i>	2	—	—	—	—	—	—
<i>Spiranthes romanzoffiana</i>	—	—	—	—	t	—	—
<i>Stellaria</i> sp.	—	—	—	—	—	—	—
<i>Stellaria calycantha</i>	—	—	—	—	—	—	—
<i>Stellaria longipes</i>	—	t	—	—	—	—	—
<i>Tofieldia</i> sp.	t	—	—	—	—	—	—
<i>Trientalis europaea</i>	—	—	—	—	1	—	—
<i>Valeriana capitata</i>	1	—	—	—	—	—	—
<i>Viola</i> sp.	—	—	—	1	2	—	—

**Table 30—Aboveground phytomass of forbs on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin (continued)**

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Woodsia alpina</i>	—	—	—	—	—	—	—
<i>Zygadenus elegans</i>	—	—	—	—	3	—	—
Total, forbs	45	51	24	149	55	50	28
% of phytomass	(0.25)	(0.43)	(0.16)	(0.34)	(0.07)	(0.27)	(1.09)

— = plant not sampled in this type.

<sup>a</sup>t = trace, less than 1 kilogram per hectare.

**Table 31—Aboveground phytomass of grass and grasslike species on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin**

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Agropyron</i> sp.	—	—	—	—	—	—	72
<i>Calamagrostis canadensis</i>	6	88	3	161	24	—	—
<i>Calamagrostis</i> sp.	—	—	—	—	—	—	—
<i>Carex rostrata</i>	—	—	—	—	—	—	—
<i>Carex</i> sp.	28	89	27	—	—	—	—
<i>Eriophorum</i> sp.	—	23	—	—	—	—	—
<i>Festuca altaica</i>	—	—	—	—	—	—	—
<i>Festuca</i> sp.	3	—	—	—	—	—	—
Grass	14	3	17	12	19	8	—
<i>Scirpus</i> sp.	—	—	—	—	—	—	—
Total, grasses	51	203	47	173	43	8	72
% of phytomass	(0.28)	(1.72)	(0.30)	(0.39)	(0.06)	(0.042)	(2.80)

— = plant not sampled in this type.

**Table 32—Aboveground phytomass of lichens on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin**

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Cetraria cucullata</i>	13	7	20	—	—	—	—
<i>Cetraria islandica</i>	—	—	2	—	—	—	—
<i>Cetraria nivalis</i>	—	—	1	—	—	—	—
<i>Cetraria</i> sp.	—	11	—	1	—	—	—
<i>Cladina alpestris</i>	—	—	—	—	—	—	—
<i>Cladina mitis</i>	—	10	—	—	—	—	—
<i>Cladina rangiferina</i>	—	—	—	—	—	—	—
<i>Cladina</i> sp.	57	41	133	1	1	96	—
<i>Cladonia coccifera</i>	—	—	—	—	—	—	—
<i>Cladonia coniocraea</i>	—	—	—	—	—	—	—
<i>Cladonia</i> sp.	5	10	50	1	3	32	17
<i>Dactylina</i> sp.	—	—	—	—	—	—	—
Lichen	15	1	21	1	4	—	—
<i>Masonhalea richardsonii</i>	—	—	15	—	—	—	—
<i>Nephroma arcticum</i>	—	2	17	—	—	—	—
<i>Nephroma</i> sp.	7	5	4	—	—	—	—
<i>Parmelia</i> sp.	—	—	—	t <sup>a</sup>	—	—	—
<i>Peltigera canina</i>	3	20	9	—	—	—	—
<i>Peltigera</i> sp.	9	16	13	2	2	37	2
<i>Stereocaulon paschale</i>	t	—	—	—	—	—	—
<i>Stereocaulon</i> sp.	6	—	6	—	—	—	309
Total, lichens	115	123	291	6	10	165	328
% of phytomass	(0.64)	(1.04)	(1.88)	(0.01)	(0.01)	(0.89)	(12.75)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

**Table 33—Aboveground phytomass of mosses, clubmosses, and liverworts on forested needleleaf woodland and broadleaf vegetation types in the Tanana River basin**

Species	Vegetation type						
	Woodland needleleaf white spruce	Woodland needleleaf black spruce	Woodland needleleaf mixed spruces	Closed broadleaf paper birch	Closed broadleaf aspen	Open broadleaf paper birch	Woodland broadleaf cottonwood
<i>Kilograms per hectare</i>							
<i>Aulacomnium</i> sp.	8 <sup>a</sup>	22	63	1	6	—	—
<i>Brachythecium</i> sp.	t <sup>a</sup>	—	—	2	—	—	—
<i>Bryum</i> sp.	2	—	—	—	—	—	—
<i>Climacium dendroides</i>	1	—	—	—	—	—	—
<i>Dicranum</i> sp.	—	17	1	4	—	—	—
<i>Distichium</i> sp.	—	1	—	—	—	—	—
<i>Drepanocladus</i> sp.	10	t	—	—	—	—	—
<i>Fissidens</i> sp.	—	—	—	t	—	—	—
<i>Hepaticae</i>	—	—	—	t	—	—	—
<i>Hepatica</i> sp.	—	—	—	—	—	—	—
<i>Hylocomium</i> sp.	—	—	—	1	1	—	—
<i>Hylocomium splendens</i>	230	67	7	91	94	—	—
<i>Lycopodium annotinum</i>	2	—	1	9	—	9	—
<i>Minium</i> sp.	—	t	—	1	—	4	—
Moss	25	2	7	13	2	—	59
<i>Pleurozium schreberi</i>	15	42	62	12	1	18	—
<i>Polytrichum juniperum</i>	—	t	—	—	—	—	—
<i>Polytrichum</i> sp.	5	12	13	7	2	78	—
<i>Ptilium ciliare</i>	1	—	—	—	—	—	—
<i>Ptilium crista-castrensis</i>	—	—	—	1	—	—	—
<i>Rhytidadelphus triquetrus</i>	—	—	—	1	—	—	—
<i>Rhytidium rugosum</i>	—	—	—	—	—	—	—
<i>Rhytidium</i> sp.	1	—	—	—	—	—	—
<i>Sphagnum</i> sp.	20	86	—	4	—	—	—
<i>Splachnum luteum</i>	—	—	—	—	—	—	—
<i>Thuidium</i> sp.	—	—	—	—	—	—	—
<i>Tomentypnum nitens</i>	17	—	3	—	—	—	—
<i>Tomentypnum</i> sp.	—	12	—	—	—	—	—
Total, mosses	337	261	157	147	106	109	59
% of phytomass	(1.88)	(2.21)	(1.01)	(0.33)	(0.14)	(0.59)	(2.29)

— = plant not sampled in this type.

<sup>a</sup> t = trace, less than 1 kilogram per hectare.

## Appendix E: Phytomass on Tall Shrub Nonforest Vegetation Types

Table 34—Aboveground phytomass for trees on tall shrub vegetation types in the Tanana River basin

Species	Vegetation type							
	Closed <sup>a</sup> tall <sup>b</sup> shrub willow	Closed tall shrub alder	Closed tall shrub birch	Closed tall shrub alder/ willow	Open tall shrub willow	Open tall shrub alder	Open tall shrub birch	Open tall shrub alder/ willow
<i>Kilograms per hectare</i>								
<i>Larix laricina</i>	—	—	—	—	1151	—	—	—
<i>Picea glauca</i>	t <sup>c</sup>	16 622	—	t	—	—	—	—
<i>Picea mariana</i>	—	—	309	323	909	—	—	—
Total, needleleaf	t	16 622	309	323	2060	—	—	—
<i>Betula papyrifera</i>	t	—	—	2442	135	—	—	289
<i>Populus balsamifera</i>	—	—	—	1684	—	—	169	—
<i>Populus tremuloides</i>	—	t	—	—	137	150	—	272
<i>Populus trichocarpa</i>	—	—	—	—	—	—	—	77
Total, broadleaf	t	t	—	4126	272	150	—	441
Total, live trees	t	16 622	309	4450	2332	150	—	441
% of live phytomass	(0.00)	(66.46)	(3.55)	(30.77)	(40.98)	(2.14)	(0.00)	(8.62)
Total, other plants	1921	8389	8391	10 013	3359	6868	11 165	4677
Total, live plants	1921	25 011	8700	14 463	5691	7018	11 165	5118
Downed trees and logs	—	—	—	—	—	—	—	—
Standing dead trees	—	—	—	—	—	—	—	—
Total, dead trees	—	—	—	—	—	—	—	—
Total, live and dead	1921	25 011	8700	14 463	5691	7018	11 165	5118
								12 411

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 35—Aboveground phytomass for alder, birch, and willow shrubs on tall shrub vegetation types in the Tanana River basin**

Species	Vegetation type								
	Closed <sup>a</sup> tall <sup>b</sup> shrub willow	Closed tall shrub alder	Closed tall shrub birch	Closed tall shrub alder/ willow	Open tall shrub willow	Open tall shrub alder	Open tall shrub birch	Open tall shrub alder/ willow	Open tall shrub birch/ willow
<i>Kilograms per hectare</i>									
<i>Alnus crispa</i>	—	5590	680	—	—	—	—	1689	—
<i>Alnus sinuata</i>	—	—	—	1086	252	1464	—	—	—
<i>Alnus tenuifolia</i>	—	—	—	1398	—	—	—	—	—
<i>Betula glandulosa</i>	—	—	2430	—	—	3457	1649	—	4438
<i>Betula nana</i>	197	52	—	—	220	—	—	—	676
<i>Betula occidentalis</i>	—	—	1710	—	—	—	6839	—	—
<i>Salix alaxensis</i>	—	—	—	774	—	—	—	—	—
<i>Salix bebbiana</i>	—	103	—	—	32	—	—	—	—
<i>Salix glauca</i>	3	—	—	2458	908	—	1175	—	4516
<i>Salix lanata</i>	—	—	—	—	121	—	—	1228	—
<i>Salix myrtillifolia</i>	—	—	—	—	—	—	—	763	—
<i>Salix planifolia</i>	—	—	—	1768	351	—	—	—	325
<i>Salix reticulata</i>	—	—	—	—	3	—	—	—	—
<i>Salix</i> sp.	275	—	423	1225	639	112	—	—	—
Total, tall shrubs	475	5745	5243	8709	2526	5033	9663	3680	9955
% of live phytomass	(24.73)	(22.97)	(60.26)	(60.22)	(44.39)	(71.72)	(86.55)	(71.90)	(80.21)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

**Table 36—Aboveground phytomass for other shrubs on tall shrub vegetation types in the Tanana River basin**

Species	Vegetation type							
	Closed tall <sup>a</sup> shrub willow	Closed tall shrub alder	Closed tall shrub birch	Closed tall shrub alder/ willow	Open tall shrub willow	Open tall shrub alder	Open tall shrub birch	Open tall shrub alder/ willow
<i>Kilograms per hectare</i>								
<i>Arctostaphylos rubra</i>	—	—	—	13	—	—	—	—
<i>Artemisia</i> sp.	—	—	—	1	—	—	—	—
<i>Artemisia tilesii</i>	—	—	—	—	—	—	—	84
<i>Cassiope tetragona</i>	—	—	—	—	3	—	—	—
<i>Chamaedaphne calyculata</i>	—	—	—	86	20	—	—	—
<i>Empetrum nigrum</i>	—	—	—	—	2	13	—	—
<i>Juniperus communis</i>	—	—	—	—	—	11	—	—
<i>Ledum groenlandicum</i>	—	243	761	82	224	444	668	—
<i>Ledum palustre decumbens</i>	25	—	401	—	—	344	35	—
<i>Linnaea borealis</i>	—	35	—	—	t <sup>c</sup>	14	—	—
<i>Potentilla fruticosa</i>	18	—	—	—	—	—	—	327
<i>Ribes</i> sp.	—	—	15	—	—	—	—	—
<i>Ribes triste</i>	—	177	—	—	—	—	—	—
<i>Rosa acicularis</i>	—	74	37	32	—	—	7	9
<i>Rubus arcticus</i>	7	—	8	—	—	—	—	3
<i>Rubus chamaemorus</i>	1	—	—	—	—	—	—	—
<i>Rumex arcticus</i>	34	—	—	—	—	—	—	—
<i>Shepherdia canadensis</i>	—	—	—	—	25	—	—	—
<i>Sorbus scopulina</i>	—	—	—	—	—	29	—	—
<i>Spiraea beauverdiana</i>	—	328	—	298	30	123	—	—
<i>Vaccinium oxycoccus</i>	—	—	—	2	—	—	—	—
<i>Vaccinium vitis-idaea</i>	—	38	69	7	20	7	48	2
<i>Vaccinium uliginosum</i>	47	511	1298	61	151	562	195	124
<i>Viburnum edule</i>	—	147	—	—	—	—	—	1362
Total, low shrubs	132	1553	2589	582	475	1547	953	544
% of live phytomass	(6.87)	(6.21)	(29.76)	(4.02)	(8.35)	(22.04)	(8.54)	(10.63)
								(11.76)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 37—Aboveground phytomass of forbs on tall shrub vegetation types in the Tanana River basin**

Species	Vegetation type							
	Closed tall shrub willow	Closed tall shrub alder	Closed tall shrub birch	Closed tall shrub alder/ willow	Open tall shrub willow	Open tall shrub alder	Open tall shrub birch	Open tall shrub alder/ willow
<i>Kilograms per hectare</i>								
<i>Aconitum delphinifolium</i>	t <sup>c</sup>	—	—	—	—	—	—	—
<i>Caltha palustris</i>	96	—	—	—	—	—	—	—
<i>Cicuta mackenzieana</i>	170	—	—	—	—	—	—	—
<i>Cornus canadensis</i>	—	—	—	—	2	14	—	—
<i>Cornus</i> sp.	—	—	—	t	—	—	—	—
<i>Epilobium angustifolium</i>	—	—	—	—	7	—	5	36
<i>Epilobium latifolium</i>	—	—	—	—	—	—	—	73
<i>Equisetum arvense</i>	—	—	—	—	12	—	—	5
<i>Equisetum fluviatile</i>	128	—	—	—	—	—	—	39
<i>Equisetum palustre</i>	—	24	—	1	1	—	—	—
<i>Equisetum pratense</i>	—	—	—	—	—	—	2	—
<i>Equisetum scirpoides</i>	—	—	—	—	—	—	—	15
<i>Equisetum silvaticum</i>	—	—	—	18	—	—	—	—
<i>Equisetum</i> sp.	—	—	22	—	—	—	—	—
<i>Erigeron</i> sp.	—	—	—	—	—	—	—	1
Forb	—	—	—	—	2	—	—	—
<i>Hedysarum</i>	—	—	—	—	—	—	—	4
<i>Lupinus</i> sp.	—	—	—	—	—	—	1	—
<i>Mertensia paniculata</i>	—	—	—	—	2	—	2	4
<i>Mimulus guttatus</i>	1	—	—	—	—	—	—	—
Mushroom	—	—	—	—	—	—	t	—
<i>Nuphar</i> sp.	45	—	—	—	—	—	—	—
Other unidentified	—	31	—	9	14	6	—	6
<i>Parnassia palustris</i>	—	—	—	—	—	—	—	1
<i>Petasites frigidus</i>	—	—	—	40	23	—	—	—
<i>Petasites hyperboreus</i>	11	—	12	—	—	—	—	—
<i>Petasites</i> sp.	—	—	—	—	—	—	—	—
<i>Polemonium</i> sp.	6	—	—	10	1	—	—	—
<i>Potentilla palustris</i>	—	—	—	24	24	—	—	—
<i>Potentilla</i> sp.	4	—	—	—	—	—	—	—
<i>Pyrola asarifolia</i>	—	—	—	9	—	—	—	—
<i>Pyrola grandiflora</i>	—	2	50	—	—	—	—	—
<i>Pyrola</i> sp.	—	—	—	3	—	—	—	—
<i>Ranunculus lapponicus</i>	6	—	—	—	—	—	—	—
<i>Ranunculus</i> sp.	—	—	—	—	3	—	—	—
<i>Rumex</i> sp.	—	84	—	—	—	—	—	—
<i>Sedum rosea</i>	2	—	—	—	—	—	—	—
<i>Stellaria</i> sp.	1	—	—	1	—	—	—	—
<i>Taraxacum</i> sp.	—	—	—	—	—	—	—	—
<i>Thalictrum</i> sp.	—	—	—	—	—	—	—	—
<i>Trientalis europaea</i>	—	—	—	—	—	—	—	1
<i>Valeriana capitata</i>	2	—	—	—	—	—	—	—

Table 37—Aboveground phytomass of forbs on tall shrub vegetation types in the Tanana River basin  
(continued)

Species	Vegetation type							
	Closed <sup>a</sup> tall <sup>b</sup> shrub willow	Closed tall shrub alder	Closed tall shrub birch	Closed tall shrub alder/ willow	Open tall shrub willow	Open tall shrub alder	Open tall shrub birch	Open tall shrub alder/ willow
Kilograms per hectare								
<i>Viola epipsila</i>	2	—	—	—	—	—	—	—
<i>Viola</i> sp.	1	—	—	—	—	—	—	—
Total, forbs	475	141	84	115	91	20	10	139
% of phytomass	(24.73)	(0.56)	(0.97)	(0.80)	(1.60)	(0.28)	(0.09)	(2.72)
								(0.37)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

Table 38—Aboveground phytomass of grass and grasslike species on tall shrub vegetation types in the Tanana River basin

Species	Vegetation type							
	Closed <sup>a</sup> tall <sup>b</sup> shrub willow	Closed tall shrub alder	Closed tall shrub birch	Closed tall shrub alder/ willow	Open tall shrub willow	Open tall shrub alder	Open tall shrub birch	Open tall shrub alder/ willow
Kilograms per hectare								
<i>Calamagrostis canadensis</i>	581	493	—	338	18	24	193	—
<i>Carex</i> sp.	45	—	—	59	73	—	—	—
Grass	9	—	116	—	—	—	25	170
<i>Glyceria</i> sp.	60	—	—	—	—	—	—	—
Total, grasses	695	493	116	397	91	24	218	170
% of live phytomass	(36.18)	(1.97)	(1.33)	(2.74)	(1.60)	(0.34)	(1.95)	(3.32)
								(2.88)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

**Table 39—Aboveground phytomass of lichens on tall shrub vegetation types in the Tanana River basin**

Species	Vegetation type								
	Closed tall <sup>a</sup> shrub willow	Closed tall shrub alder	Closed tall shrub birch	Closed tall shrub alder/ willow	Open tall shrub willow	Open tall shrub alder	Open tall shrub birch	Open tall shrub alder/ willow	Open tall shrub birch/ willow
<i>Kilograms per hectare</i>									
<i>Cetraria</i> sp.	—	—	—	3	20	—	—	—	—
<i>Cladina</i> sp.	—	—	—	—	—	26	26	4	—
<i>Cladonia</i> sp.	4	—	—	—	4	—	28	—	—
Lichen	6	—	10	1	—	—	—	—	—
<i>Parmelia</i> sp.	—	—	5	—	—	—	—	—	—
<i>Peltigera canina</i>	—	—	—	—	—	37	—	—	—
<i>Peltigera</i> sp.	—	—	—	7	85	—	20	2	12
<i>Stereocaulon</i> sp.	—	—	—	—	—	10	—	14	—
Total, lichens	10	—	15	11	109	73	74	20	12
% of phytomass	(0.52)	(0.00)	(0.17)	(0.08)	(1.92)	(1.04)	(0.66)	(0.39)	(0.10)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

**Table 40—Aboveground phytomass of mosses and clubmosses on tall shrub vegetation types in the Tanana River basin**

Species	Vegetation type								
	Closed <sup>a</sup> tall <sup>b</sup> shrub willow	Closed tall shrub alder	Closed tall shrub birch	Closed tall shrub alder/ willow	Open tall shrub willow	Open tall shrub alder	Open tall shrub birch	Open tall shrub alder/ willow	Open tall shrub birch/ willow
<i>Kilograms per hectare</i>									
<i>Aulacomnium</i> sp.	41	—	—	19	8	45	—	—	69
<i>Brachythecium</i> sp.	15	—	—	—	—	—	—	2	—
<i>Dicranum</i> sp.	—	—	—	15	3	—	—	—	4
<i>Hylocomium</i> sp.	—	—	—	3	46	—	—	—	—
<i>Hylocomium splendens</i>	—	364	180	—	—	14	162	72	—
<i>Lycopodium alpinum</i>	—	—	61	—	—	—	—	—	—
<i>Lycopodium annotinum</i>	—	—	—	—	—	51	—	—	—
<i>Lycopodium complanatum</i>	—	—	—	4	—	4	—	—	—
<i>Lycopodium</i> sp.	—	24	—	—	—	—	—	—	—
<i>Mnium</i> sp.	1	—	—	—	—	—	—	2	—
Moss	31	—	20	1	10	—	—	39	—
<i>Pleurozium schreberi</i>	—	—	35	99	—	28	16	9	7
<i>Polytrichum</i> sp.	22	—	—	—	—	29	69	—	4
<i>Sphagnum</i> sp.	24	69	48	58	—	—	—	—	131
<i>Tomenthypnum</i> sp.	—	—	—	—	1	—	—	—	—
Total, mosses	134	457	344	199	68	171	247	124	215
% of phytomass	(6.98)	(1.83)	(3.95)	(1.38)	(1.19)	(2.44)	(2.21)	(2.42)	(1.73)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

## Appendix F: Phytomass on Low Shrub Nonforest Vegetation Types

Table 41—Aboveground phytomass for trees on low shrub vegetation types in the Tanana River basin

Species	Vegetation type									
	Closed <sup>a</sup> low shrub birch	Closed low shrub willow	Closed low shrub birch/ willow	Closed low shrub Erica- ceous	Open low shrub birch	Open low shrub willow	Open low shrub birch/ willow	Open low shrub willow/ sedge	Open low shrub birch/ sedge	Open low shrub mixed/ grass
<i>Kilograms per hectare</i>										
<i>Larix laricina</i>	—	—	—	—	—	146	—	—	—	—
<i>Picea glauca</i>	108	—	19	—	6	484	135	3653	2505	t <sup>c</sup>
<i>Picea mariana</i>	394	—	—	—	—	1994	—	—	—	—
Total, needleleaf	502	—	19	—	6	2624	135	3653	2505	t
<i>Betula papyrifera</i>	—	—	—	—	—	—	—	—	—	—
<i>Populus tremuloides</i>	—	—	—	—	173	—	—	—	—	—
Total, broadleaf	—	—	t	—	173	—	—	—	t	—
Total, live trees	502	—	19	—	179	2624	135	3653	2505	t
% of phytomass	(8.64)	(0.00)	(0.80)	(0.00)	(8.84)	(44.71)	(8.53)	(92.18)	(46.55)	(0.00)
Total, other plants	5311	3979	2348	6659	1847	3245	1447	310	2876	2879
Total, all live plants	5813	3979	2367	6659	2026	5869	1582	3963	5381	2879
Downed trees and logs	—	—	—	—	—	—	—	—	—	—
Standing dead trees	—	—	—	885	—	—	—	—	—	—
Total, dead trees	—	—	—	885	—	—	—	—	—	—
Total, live and dead plants	5813	233	2367	7544	2026	5869	1582	3963	5381	2879

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 42—Aboveground phytomass of alder, birch, and willow shrubs on low shrub vegetation types in the Tanana River basin**

Species	Vegetation type									
	Closed <sup>a</sup> low <sup>b</sup> shrub birch	Closed low shrub willow	Closed low shrub birch/ willow	Closed low shrub Erica- ceous	Open low shrub birch	Open low shrub willow	Open low shrub birch/ willow	Open low shrub willow/ sedge	Open low shrub birch/ sedge	Open low shrub mixed/ grass
<i>Kilograms per hectare</i>										
<i>Alnus crispa</i>	—	—	—	—	—	—	—	—	524	673
<i>Alnus sinuata</i>	—	—	—	—	—	—	—	t <sup>c</sup>	—	—
<i>Betula glandulosa</i>	2293	—	229	1859	826	522	342	—	953	—
<i>Betula nana</i>	438	—	601	1370	80	787	—	—	—	1005
<i>Betula occidentalis</i>	—	—	—	—	—	—	285	—	—	—
<i>Salix glauca</i>	—	—	199	1952	—	502	—	—	—	—
<i>Salix monticola</i>	—	—	196	—	—	—	—	—	135	—
<i>Salix myrtillifolia</i>	4	—	—	—	—	64	—	—	—	—
<i>Salix phlebophylla</i>	—	—	5	—	—	—	—	—	—	—
<i>Salix planifolia</i>	327	—	—	174	173	337	—	—	6	—
<i>Salix reticulata</i>	—	—	—	39	11	11	—	—	—	—
<i>Salix</i> sp.	642	2571	165	—	—	—	119	t	—	142
Total, tall shrubs	3704	2571	1395	5394	1090	2223	746	0	1618	1820
% of phytomass	(63.72)	(64.61)	(58.94)	(81.00)	(53.80)	(37.88)	(47.16)	(0.00)	(30.07)	(63.22)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 43—Aboveground phytomass of other shrubs on low shrub vegetation types in the Tanana River basin**

Species	Vegetation type									
	Closed <sup>a</sup> low shrub birch	Closed low shrub willow	Closed low shrub birch/ willow	Closed low shrub Erica- ceous	Open low shrub birch	Open low shrub willow	Open low shrub birch/ willow	Open low shrub willow/ sedge	Open low shrub birch/ sedge	Open low shrub mixed/ grass
<i>Kilograms per hectare</i>										
<i>Arctostaphylos alpina</i>	—	—	34	—	33	—	—	—	—	—
<i>Arctostaphylos rubra</i>	7	29	—	33	3	17	—	—	—	—
<i>Arctostaphylos uva-ursi</i>	—	4	—	—	3	—	—	—	—	—
<i>Artemisia</i> sp.	2	17	—	2	—	—	—	—	—	—
<i>Artemisia arctica</i>	—	—	—	—	t <sup>c</sup>	—	—	—	—	—
<i>Chamaedaphne calyculata</i>	—	—	—	—	—	—	—	—	—	130
<i>Diapensia lapponica</i>	—	—	—	—	2	—	—	—	—	—
<i>Dryas octopetala</i>	—	—	—	—	—	1	—	—	—	—
<i>Dryas</i> sp.	—	—	—	12	6	—	—	—	—	—
<i>Empetrum nigrum</i>	30	—	33	6	18	4	63	—	17	—
<i>Ledum groenlandicum</i>	20	—	—	—	—	217	—	—	117	—
<i>Ledum palustre decumbens</i>	254	—	86	—	32	10	—	—	102	77
<i>Linnaea borealis</i>	—	—	2	—	—	—	—	t	5	—
<i>Potentilla fruticosa</i>	38	—	—	226	—	3	—	—	—	—
<i>Rosa acicularis</i>	—	—	—	—	—	—	3	t	—	—
<i>Rubus arcticus</i>	2	—	—	—	—	1	—	—	—	—
<i>Rubus chamaemorus</i>	t	—	—	—	—	—	—	—	—	—
<i>Rumex arcticus</i>	—	—	—	8	—	—	—	—	—	—
<i>Shepherdia canadensis</i>	—	896	—	—	—	—	—	—	—	—
<i>Spiraea beauverdiana</i>	6	—	—	—	—	16	—	—	15	—
<i>Vaccinium vitis-idaea</i>	9	—	23	6	10	23	28	t	51	—
<i>Vaccinium uliginosum</i>	398	—	250	73	140	246	192	—	445	314
Total, low shrubs	766	946	428	366	247	538	286	t	752	521
% of phytomass	(13.18)	(23.77)	(18.08)	(5.50)	(12.19)	(9.17)	(18.08)	(0.00)	(13.98)	(18.10)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

Table 44—Aboveground phytomass of forbs on low shrub vegetation types in the Tanana River basin

Species	Vegetation type									
	Closed <sup>a</sup> low <sup>b</sup> shrub birch	Closed low shrub willow	Closed low shrub birch/ willow	Closed low shrub Erica- ceous	Open low shrub birch	Open low shrub willow	Open low shrub birch/ willow	Open low shrub willow/ sedge	Open low shrub birch/ sedge	Open low shrub mixed/ grass
<i>Kilograms per hectare</i>										
<i>Aconitum delphinifolium</i>	1	—	—	—	—	—	1	—	—	—
<i>Anemone narcissiflora</i>	—	—	t <sup>c</sup>	—	1	2	—	—	—	—
<i>Antennaria sp.</i>	—	—	—	—	—	—	1	—	—	—
<i>Aster sibiricus</i>	—	15	—	—	—	—	—	—	—	—
<i>Campanula lasiocarpa</i>	—	—	—	—	—	t	1	—	—	—
<i>Cardamine sp.</i>	—	—	—	—	—	—	—	—	—	—
<i>Claytonia sp.</i>	—	—	—	—	—	—	t	—	—	—
<i>Cornus canadensis</i>	—	—	1	—	—	t	3	—	—	—
<i>Dodecatheon frigidum</i>	—	—	—	—	—	—	1	—	—	—
<i>Dodecatheon sp.</i>	—	—	—	—	—	1	—	—	—	—
<i>Epilobium angustifolium</i>	—	56	—	—	42	7	—	—	—	—
<i>Equisetum arvense</i>	—	—	1	—	—	8	—	—	t	—
<i>Equisetum pratense</i>	—	—	—	4	—	—	—	—	—	—
<i>Equisetum scirpoides</i>	5	—	—	—	—	—	1	—	—	—
Fern	—	1	—	—	—	—	—	4	—	—
Forb	2	—	—	—	—	—	2	—	—	—
<i>Gentiana algida</i>	—	—	—	—	—	2	1	—	—	—
<i>Geocaulon lividum</i>	—	—	—	—	—	—	—	t	—	—
<i>Lupinus arcticus</i>	—	—	—	—	—	—	2	—	—	—
<i>Lupinus sp.</i>	—	—	—	—	21	—	—	—	—	—
<i>Mertensia paniculata</i>	4	14	—	8	—	—	1	—	1	—
Mushroom	t	—	—	t	—	t	—	—	t	t
Other unidentified	4	—	8	—	2	—	13	—	—	—
<i>Pedicularis kanei</i>	t	—	—	—	—	—	t	—	—	—
<i>Pedicularis capitata</i>	—	—	—	—	—	—	t	—	—	—
<i>Pedicularis labradorica</i>	—	—	—	—	—	—	t	—	—	—
<i>Pedicularis sp.</i>	—	—	—	t	6	—	—	—	—	—
<i>Petasites</i>	3	—	—	—	—	—	—	—	—	—
<i>Petasites frigidus</i>	—	—	—	—	5	11	4	—	t	—
<i>Petasites hyperboreus</i>	5	—	10	—	—	—	1	—	—	—
<i>Polemonium acutiflorum</i>	1	—	t	18	—	—	1	—	—	—
<i>Polemonium sp.</i>	2	—	—	—	—	—	—	—	—	—
<i>Polygonum bistorta</i>	—	—	—	—	—	2	3	—	—	15
<i>Polygonum sp.</i>	1	—	—	—	—	—	—	—	—	—
<i>Polygonum vivarparum</i>	—	—	—	—	—	—	3	—	—	—
<i>Potentilla palustris</i>	—	—	—	—	—	—	—	—	t	—
<i>Potentilla sp.</i>	2	—	—	—	—	—	—	—	—	—
<i>Pyrola sp.</i>	1	—	—	—	—	—	—	—	—	—
<i>Ranunculus sp.</i>	—	11	—	2	1	—	2	—	—	—
<i>Rumex sp.</i>	4	—	—	—	—	—	—	—	—	—
<i>Saussurea angustifolia</i>	—	—	1	—	8	—	t	—	—	—
<i>Saxifraga hieracifolia</i>	—	—	—	—	—	—	—	—	—	—
<i>Saxifraga punctata</i>	—	—	—	—	t	—	—	—	—	—
<i>Saxifraga sp.</i>	—	55	—	—	—	—	—	—	—	—

**Table 44—Aboveground phytomass of forbs on low shrub vegetation types in the Tanana River basin  
(continued)**

Species	Vegetation type									
	Closed <sup>a</sup> low <sup>b</sup> shrub birch	Closed low shrub willow	Closed low shrub birch/ willow	Closed low shrub Erica- ceous	Open low shrub birch	Open low shrub willow	Open low shrub birch/ willow	Open low shrub willow/ sedge	Open low shrub birch/ sedge	Open low shrub mixed/ grass
<i>Kilograms per hectare</i>										
<i>Saxifraga tricuspidata</i>	—	—	—	—	—	—	10	—	—	—
<i>Sedum rosea</i>	t	—	—	—	—	—	—	—	—	—
<i>Senecio luguens</i>	—	—	—	3	—	t	—	—	—	—
<i>Senecio</i> sp.	—	22	—	—	—	t	—	—	—	—
<i>Senecio triangularis</i>	1	—	—	—	—	—	—	—	—	—
<i>Solidago multiradiata</i>	—	10	—	6	—	—	—	—	—	—
<i>Spiranthes romanzoffiana</i>	—	—	—	—	—	t	—	—	—	—
<i>Stellaria</i> sp.	t	—	—	—	1	—	—	—	—	—
<i>Thalictrum</i> sp.	—	—	—	1	—	t	—	—	—	—
<i>Valeriana capitata</i>	1	—	—	2	5	1	—	—	—	—
Total, forbs	37	184	21	76	76	59	15	t	15	—
% of phytomass	(0.64)	(4.62)	(0.89)	(1.14)	(3.75)	(1.01)	(0.95)	(0.00)	(0.28)	(0.00)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 45—Aboveground phytomass of grasses and grasslike species on low shrub vegetation types in the Tanana River basin**

Species	Vegetation type									
	Closed <sup>a</sup> low <sup>b</sup> shrub birch	Closed low shrub willow	Closed low shrub birch/ willow	Closed low shrub Erica- ceous	Open low shrub birch	Open low shrub willow	Open low shrub birch/ willow	Open low shrub willow/ sedge	Open low shrub birch/ sedge	Open low shrub mixed/ grass
<i>Kilograms per hectare</i>										
<i>Calamagrostis canadensis</i>	58	—	13	—	—	2	—	t <sup>c</sup>	5	199
<i>Calamagrostis</i> sp.	—	—	—	—	—	1	—	—	—	—
<i>Carex aquatilis</i>	54	—	—	—	—	—	—	—	—	—
<i>Carex</i> sp.	216	—	41	73	57	19	—	t	9	221
<i>Festuca altaica</i>	—	—	24	—	—	20	—	—	—	—
<i>Festuca</i> sp.	24	—	—	—	—	—	—	—	—	—
Grass	5	45	2	102	58	—	16	—	2	—
<i>Hierochloe alpina</i>	—	—	13	—	1	4	—	—	—	—
<i>Trisetum spicatum</i>	—	—	—	—	—	—	—	—	—	—
Total, grasses	357	45	93	175	116	46	16	t	16	420
% of phytomass	(6.14)	(1.13)	(3.93)	(2.63)	(5.73)	(0.78)	(1.01)	(0.00)	(0.30)	(14.59)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 46—Aboveground phytomass of lichens on low shrub vegetation types in the Tanana River basin**

Species	Vegetation type									
	Closed <sup>a</sup> low <sup>b</sup> shrub birch	Closed low shrub willow	Closed low shrub birch/ willow	Closed low shrub Erica- ceous	Open low shrub birch	Open low shrub willow	Open low shrub birch/ willow	Open low shrub willow/ sedge	Open low shrub birch/ sedge	Open low shrub mixed/ grass
<i>Kilograms per hectare</i>										
<i>Cetraria cucullata</i>	—	—	5	—	60	t <sup>c</sup>	—	—	—	—
<i>Cetraria islandica</i>	8	—	—	—	3	1	—	—	6	—
<i>Cladina mitis</i>	—	—	—	—	—	—	—	—	6	—
<i>Cetraria nivalis</i>	—	—	1	—	3	—	—	—	—	—
<i>Cetraria</i> sp.	—	—	—	—	—	9	—	—	1	—
<i>Cladina</i> sp.	21	—	50	—	24	19	4	—	—	—
<i>Cladonia</i> sp.	9	—	1	6	22	8	2	—	—	—
<i>Dactylina</i> sp.	—	—	—	—	—	6	—	—	—	—
Lichen	2	—	—	—	—	—	264	—	—	—
<i>Masonhalea richardsonii</i>	—	—	21	—	18	1	—	—	—	—
<i>Nephroma arcticum</i>	—	—	12	—	4	—	—	—	—	—
<i>Peltigera canina</i>	4	—	27	—	5	—	—	—	12	—
<i>Peltigera</i> sp.	21	—	—	25	—	46	10	—	—	—
<i>Stereocaulon paschale</i>	—	—	—	—	—	—	—	—	—	—
<i>Stereocaulon</i> sp.	54	—	56	—	56	38	24	—	—	—
Total, lichens	119	—	173	31	195	128	304	—	25	—
% of phytomass	(2.05)	(0.00)	(7.31)	(0.47)	(9.62)	(2.18)	(19.22)	(0.00)	(0.46)	(0.00)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 47—Aboveground phytomass of mosses and clubmosses on low shrub vegetation types in the Tanana River basin**

Species	Vegetation type									
	Closed <sup>a</sup> low shrub birch	Closed low shrub willow	Closed low shrub birch/ willow	Closed low shrub Erica- ceous	Open low shrub birch	Open low shrub willow	Open low shrub birch/ willow	Open low shrub willow/ sedge	Open low shrub birch/ sedge	Open low shrub mixed/ grass
<i>Kilograms per hectare</i>										
<i>Aulacomnium</i> sp.	26	—	30	12	18	105	—	—	69	9
<i>Brachythecium</i> sp.	2	—	—	—	—	—	—	—	—	—
<i>Dicranum</i> sp.	—	149	—	—	—	1	—	—	18	—
<i>Hylocomium</i> sp.	3	—	—	—	—	—	—	—	—	—
<i>Hylocomium splendens</i>	128	—	2	576	—	61	—	166	288	—
<i>Lycopodium annotinum</i>	—	—	2	—	—	—	—	—	—	—
<i>Mnium</i> sp.	2	10	—	—	—	—	—	—	—	—
Moss	13	4	—	20	—	18	78	—	—	—
<i>Pleurozium schreberi</i>	22	70	136	—	34	22	—	144	35	—
<i>Polytrichum</i> sp.	22	—	23	—	14	20	2	—	14	—
<i>Ptilium crista-castrensis</i>	1	—	4	—	—	—	—	—	14	—
<i>Rhacomitrium lanuginosum</i>	—	—	5	—	27	—	—	—	—	—
<i>Rhacomitrium</i> sp.	—	—	—	—	7	—	—	—	—	—
<i>Rhytidium</i> sp.	—	—	18	9	—	—	—	—	—	—
<i>Sphagnum</i> sp.	109	—	18	—	18	17	—	—	12	109
<i>Tomenthypnum nitens</i>	—	—	—	—	5	—	—	—	—	—
<i>Tomenthypnum</i> sp.	—	—	—	—	—	7	—	—	—	—
Total, mosses	328	233	238	617	123	251	80	310	450	118
% of phytomass	(5.64)	(5.86)	(10.05)	(9.27)	(6.07)	(4.28)	(5.06)	(7.82)	(8.36)	(4.10)

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

## Appendix G: Phytomass on Herbaceous Nonforest Vegetation Types

Table 48—Aboveground phytomass for trees on herbaceous vegetation types in the Tanana River basin

Species	Vegetation type									
	Closed <sup>a</sup> dwarf <sup>b</sup> shrub mat cushion sedge	Closed dwarf shrub dryas	Open dwarf shrub dryas/ lichen	Open dwarf shrub low willow tundra	Mesic gram. herb. tussock tundra	Mesic gram. herb. sedge/ birch tundra	Wet gram. herb. sedge tundra	Wet gram. herb. fresh grass marsh	Wet gram. herb. low grass meadow	Wet byroid herb.
<i>Kilograms per hectare</i>										
<i>Picea glauca</i>	—	—	—	—	t <sup>c</sup>	—	—	—	17 194	—
<i>Picea mariana</i>	—	—	—	—	—	t	545	—	17 194	—
Total, needleleaf	—	—	—	—	t	t	545	—	17 194	—
<i>Betula papyrifera</i>	—	—	—	—	t	—	—	172	121	—
Total, broadleaf	—	—	—	—	t	—	—	172	121	—
Total, live trees	—	—	—	—	t	t	545	172	17 315	—
% of live phytomass	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(21.86)	(2.85)	(81.84)	(0.00)
Total, other plants	434	669	528	430	3195	2168	1948	5867	3841	1761
Total, all live plants	434	669	528	430	3195	2168	2493	6039	21 156	1761
Downed trees and logs	—	—	—	—	—	—	—	—	—	—
Standing dead trees	—	—	—	—	—	—	—	—	—	—
Total, dead trees	—	—	—	—	—	—	—	—	—	—
Total, live and dead plants	434	669	528	430	3195	2168	2493	6039	21 156	1761

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 49—Aboveground phytomass of alder, birch, and willow shrubs on herbaceous vegetation types in the Tanana River basin**

Species	Vegetation type									
	Closed dwarf <sup>a</sup> shrub mat cushion sedge	Closed dwarf shrub dryas	Open dwarf shrub dryas/ lichen	Open dwarf low willow tundra	Mesic gram. herb. tussock tundra	Mesic gram. herb. sedge/ birch tundra	Wet gram. herb. sedge tundra	Wet gram. herb. fresh grass marsh	Wet gram. herb. low grass meadow	Wet byroid herb.
<i>Kilograms per hectare</i>										
<i>Alnus sinuata</i>	—	—	—	—	205	13	—	—	2416	—
<i>Betula glandulosa</i>	—	—	—	—	—	36	—	1971	—	—
<i>Betula nana</i>	—	24	—	—	1459	354	279	—	—	11
<i>Salix arctica</i>	—	2	—	—	—	—	—	—	—	—
<i>Salix glauca</i>	—	—	—	—	—	t <sup>c</sup>	—	—	—	—
<i>Salix lanata</i>	—	—	—	—	—	130	—	—	—	—
<i>Salix phlebophylla</i>	—	8	—	27	—	—	—	—	—	—
<i>Salix planifolia</i>	—	21	—	—	—	539	—	—	—	—
<i>Salix polaris</i>	3	18	1	—	—	—	—	—	—	—
<i>Salix reticulata</i>	—	19	—	33	—	t	—	—	—	—
<i>Salix</i> sp.	—	8	—	43	277	11	100	582	101	—
Total, tall shrubs	3	100	1	103	1941	1083	379	2553	2517	11
% of phytomass	(0.69)	(14.95)	(0.19)	(23.95)	(60.75)	(49.95)	(15.2)	(42.28)	(11.90)	(0.62)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

Table 50—Aboveground phytomass of other shrubs on herbaceous vegetation types in the Tanana River basin

Species	Vegetation type									
	Closed <sup>a</sup> dwarf <sup>b</sup> shrub mat cushion sedge	Closed dwarf shrub dryas	Open dwarf shrub dryas/ lichen	Open dwarf shrub low willow tundra	Mesic gram. herb. tussock tundra	Mesic gram. herb. sedge/ birch tundra	Wet gram. herb. sedge tundra	Wet gram. herb. fresh grass marsh	Wet gram. herb. low grass meadow	Wet byroid herb.
<i>Kilograms per hectare</i>										
<i>Andromedia polifolia</i>	—	—	—	—	—	—	23	—	—	43
<i>Arctostaphylos rubra</i>	—	2	13	—	—	t <sup>c</sup>	—	—	—	—
<i>Artemisia</i> sp.	—	—	—	—	—	6	—	—	—	—
<i>Artemisia arctica</i>	—	t	—	2	—	—	—	—	—	—
<i>Cassiope tetragona</i>	8	1	t	—	—	3	—	—	—	—
<i>Chamaedaphne calyculata</i>	—	—	—	—	86	—	20	—	—	219
<i>Diapensia lapponica</i>	3	—	9	—	—	—	—	—	—	—
<i>Dryas octopetala</i>	10	36	46	1	—	t	—	—	—	—
<i>Empetrum nigrum</i>	2	—	1	2	—	16	—	—	—	—
<i>Ledum groenlandicum</i>	—	—	—	—	—	—	—	79	—	11
<i>Ledum palustre decumbens</i>	—	3	17	—	—	75	43	—	—	—
<i>Loiseleuria procumbens</i>	47	—	57	2	217	7	—	—	—	—
<i>Potentilla fruticosa</i>	—	1	—	—	—	—	—	—	—	—
<i>Rhododendron lapponicum</i>	—	3	—	—	—	—	—	—	—	—
<i>Rhododendron</i> sp.	—	1	—	—	—	—	—	—	—	—
<i>Rosa acicularis</i>	—	—	—	—	—	—	—	—	—	35
<i>Rubus arcticus</i>	—	—	—	—	—	—	—	4	18	—
<i>Rubus chamaemorus</i>	—	—	—	—	—	10	2	—	—	—
<i>Rumex arcticus</i>	—	—	—	—	—	—	1	—	—	—
<i>Spiraea beauverdiana</i>	—	—	—	—	—	72	58	—	—	—
<i>Vaccinium oxycoccus</i>	—	—	—	—	—	—	1	—	—	3
<i>Vaccinium vitis-idaea</i>	2	—	1	—	—	9	5	9	—	—
<i>Vaccinium uliginosum</i>	—	20	4	—	419	260	25	—	—	—
<i>Viburnum edule</i>	—	—	—	—	—	—	—	—	4	—
Total, other shrubs	72	67	148	7	722	458	178	92	57	276
% of phytomass	(16.59)	(10.01)	(28.03)	(1.63)	(22.60)	(21.13)	(7.14)	(1.52)	(0.27)	(15.67)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

Table 51—Aboveground phytomass of forbs on herbaceous vegetation types in the Tanana River basin

Species	Vegetation type									
	Closed <sup>a</sup> dwarf <sup>b</sup> shrub mat cushion sedge	Closed dwarf shrub dryas	Open dwarf shrub dryas/ lichen	Open dwarf shrub low willow tundra	Mesic gram. herb. tussock tundra	Mesic gram. herb. sedge/ birch tundra	Wet gram. herb. sedge tundra	Wet gram. herb. fresh grass marsh	Wet gram. herb. low grass meadow	Wet gram. herb. low grass byroid herb.
<i>Kilograms per hectare</i>										
<i>Achillea</i> sp.	—	—	—	—	—	—	—	—	—	1
<i>Aconitum delphinifolium</i>	—	1	—	—	—	—	—	—	—	—
<i>Anemone narcissiflora</i>	t <sup>c</sup>	t	—	—	—	—	—	—	—	—
<i>Antennaria friesiana</i>	—	1	4	—	—	—	—	—	—	—
<i>Antennaria</i> sp.	—	—	—	3	—	—	—	—	—	—
<i>Arabis Arenicola</i>	2	1	1	—	—	—	—	—	—	—
<i>Astragalus</i> sp.	—	t	—	1	—	—	—	—	—	—
<i>Caltha leptosepala</i>	—	—	—	—	—	—	—	—	—	118
<i>Campanula lasiocarpa</i>	—	—	—	1	—	—	—	—	—	—
<i>Castilleja</i> sp.	—	t	—	—	—	—	—	—	—	—
<i>Claytonia sarmentosa</i>	—	t	—	—	—	—	—	—	—	—
<i>Claytonia</i> sp.	—	t.	—	—	—	—	—	—	—	—
<i>Cornus canadensis</i>	—	—	—	—	—	—	7	—	—	1
<i>Draba</i> sp.	—	1	—	—	—	—	—	—	—	—
<i>Drosera anglica</i>	—	—	—	—	—	—	—	—	—	1
<i>Epilobium latifolium</i>	—	1	—	21	—	—	—	—	—	—
<i>Epilobium</i> sp.	—	—	—	3	—	—	—	—	—	—
<i>Equisetum arvense</i>	—	—	—	—	—	—	7	—	—	—
<i>Equisetum palustre</i>	—	—	—	2	—	—	—	—	—	—
<i>Equisetum</i> sp.	—	—	—	—	—	—	—	—	—	5
<i>Erigeron purdatus</i>	—	t	—	—	—	—	—	—	—	—
Forb	t	1	1	—	—	—	—	—	—	—
<i>Gentiana glauca</i>	1	—	—	—	—	—	—	—	—	—
<i>Gentiana</i> sp.	—	t	—	—	—	—	—	—	—	—
<i>Geum rossii</i>	—	11	—	—	—	—	—	—	—	—
<i>Goodyera repens</i>	—	—	—	—	—	—	—	—	—	2
<i>Ligusticum mutellinoides</i>	t	—	t	—	—	—	—	—	—	—
<i>Lupinus</i> sp.	—	2	—	—	—	—	—	—	—	—
<i>Menyanthes trifoliata</i>	—	—	—	—	—	—	—	—	—	23
Mushroom	—	t	—	—	—	—	—	—	—	—
<i>Mysotis alpestris</i>	—	1	—	—	—	—	—	—	—	—
Other unidentified	—	—	—	—	—	—	16	—	—	5
<i>Oxyria digyna</i>	—	6	—	—	—	—	—	—	—	—
<i>Oxytropis</i> sp.	t	t	—	—	—	—	—	—	—	—
<i>Pedicularis kanei</i>	—	—	1	—	—	—	—	—	—	—
<i>Pedicularis capitata</i>	—	t	—	—	t	—	—	—	—	—
<i>Pedicularis</i> sp.	—	1	—	—	1	—	—	—	—	—
<i>Petasites</i>	—	2	—	—	—	—	—	—	—	—
<i>Petasites frigidus</i>	—	—	—	—	—	—	6	—	—	—
<i>Petasites hyperboreus</i>	—	t	—	—	—	—	—	—	—	—
<i>Petasites sagittatus</i>	—	—	—	—	—	—	—	—	—	35
<i>Polemonium acutiflorum</i>	—	t	—	—	—	—	—	—	—	—
<i>Polemonium</i> sp.	—	—	—	—	—	—	—	—	—	—

**Table 51—Aboveground phytomass of forbs on herbaceous vegetation types in the Tanana River basin  
(continued)**

Species	Vegetation type									
	Closed <sup>a</sup> dwarf <sup>b</sup> shrub mat cushion sedge	Closed dwarf shrub dryas	Open dwarf shrub dryas/ lichen	Open dwarf shrub low willow tundra	Mesic gram. herb. tussock tundra	Mesic gram. herb. sedge/ birch tundra	Wet gram. herb. sedge tundra	Wet gram. herb. fresh grass marsh	Wet gram. herb. low grass meadow	Wet byroid herb.
<i>Kilograms per hectare</i>										
<i>Polygonum bistorta</i>	—	4	—	—	—	—	—	—	—	—
<i>Polygonum vivaparum</i>	—	3	—	7	—	—	—	—	—	—
<i>Potentilla palustris</i>	—	—	—	—	—	—	—	662	230	637
<i>Pyrola grandiflora</i>	—	t	—	—	—	—	—	—	—	—
<i>Pyrola</i> sp.	—	—	—	1	—	—	—	—	2	—
<i>Ranunculus lapponicus</i>	—	—	—	—	—	—	—	2	—	—
<i>Ranunculus</i> sp.	—	t	—	29	—	—	—	—	—	—
<i>Saussurea angustifolia</i>	—	1	—	—	—	—	—	—	—	—
<i>Saxifraga bronchialis</i>	—	t	—	—	—	—	—	—	—	—
<i>Saxifraga davurica</i>	—	t	—	—	—	—	—	—	—	—
<i>Saxifraga hieracifolia</i>	—	3	—	—	—	—	—	—	—	—
<i>Saxifraga serpyllifolia</i>	—	1	—	—	—	—	—	—	—	—
<i>Saxifraga</i> sp.	1	2	1	—	—	—	—	—	—	—
<i>Saxifraga tricuspidata</i>	—	—	—	3	—	—	—	—	—	—
<i>Sedum rosea</i>	—	t	—	—	—	—	—	—	—	—
<i>Senecio fuscatus</i>	—	t	—	—	—	—	—	—	—	—
<i>Senecio</i> sp.	—	—	—	t	—	—	—	—	—	—
<i>Sibbaldia procumbens</i>	—	—	—	1	—	—	—	—	—	—
<i>Silene acaulis</i>	—	1	—	t	—	3	—	—	—	—
<i>Stellaria</i> sp.	—	t	—	—	—	—	—	—	—	—
<i>Taraxacum</i> sp.	—	—	—	1	—	—	—	—	—	—
<i>Tofieldia pusilla</i>	—	—	—	1	—	—	—	—	—	—
<i>Valeriana capitata</i>	—	1	—	—	—	—	—	—	—	—
Total, forbs	4	45	8	75	—	39	—	664	394	666
% of phytomass	(0.92)	(6.73)	(1.52)	(17.44)	(0.00)	(1.80)	(0.00)	(11.00)	(1.86)	(37.82)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 52—Aboveground phytomass of grass and grasslike species on herbaceous vegetation types in the Tanana River basin**

Species	Vegetation type									
	Closed <sup>a</sup> dwarf <sup>b</sup> shrub mat cushion sedge	Closed dwarf shrub	Open dwarf shrub	Open low willow	Mesic herb. tussock	Mesic gram. herb. sedge/ birch	Wet herb. sedge	Wet fresh grass	Wet gram. herb. low grass	Wet gram. herb. byroid herb.
<i>Kilograms per hectare</i>										
<i>Calamagrostis canadensis</i>	—	—	—	—	211	17	232	796	—	—
<i>Carex aquatilis</i>	—	—	—	—	—	—	698	—	—	—
<i>Carex</i> sp.	12	61	15	19	205	235	123	1751	811	276
<i>Eriophorum</i> sp.	—	3	—	—	—	—	143	—	—	11
<i>Festuca altaica</i>	—	3	—	6	—	—	—	—	—	—
Grass	—	12	—	—	—	12	—	—	54	128
<i>Hierochloe alpina</i>	15	24	11	—	—	—	—	—	—	—
<i>Juncus</i> sp.	—	t <sup>c</sup>	—	—	—	—	—	—	—	—
<i>Poa</i> sp.	—	—	—	6	—	—	—	—	—	—
<i>Trisetum spicatum</i>	—	—	—	9	—	—	—	—	—	—
Total, grasses	27	103	26	40	416	264	1196	2547	865	415
% of phytomass	(6.22)	(15.40)	(4.92)	(9.30)	(13.02)	(12.18)	(47.97)	(42.18)	(4.09)	(23.57)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 53—Aboveground phytomass of lichens on herbaceous vegetation types in the Tanana River basin**

Species	Vegetation type								
	Closed <sup>a</sup> dwarf <sup>b</sup> shrub mat cushion sedge	Closed dwarf shrub	Open dwarf shrub dryas/ lichen	Open dwarf shrub low willow tundra	Mesic gram. herb. tussock tundra	Mesic gram. herb. sedge/ birch tundra	Wet gram. herb. sedge tundra	Wet gram. herb. fresh grass marsh	Wet gram. herb. low grass meadow
<i>Kilograms per hectare</i>									
<i>Cetraria cucullata</i>	—	5	12	—	—	30	1	—	—
<i>Cetraria islandica</i>	—	—	—	—	—	t <sup>c</sup>	—	—	—
<i>Cladina mitis</i>	—	—	—	—	—	7	—	—	—
<i>Cetraria nivalis</i>	14	4	28	—	—	t	—	—	—
<i>Cetraria</i> sp.	—	—	—	—	—	13	—	—	—
<i>Cladina</i> sp.	48	8	130	—	—	—	2	—	—
<i>Cladonia</i> sp.	65	4	32	6	—	12	1	—	—
<i>Dactylinia arctica</i>	2	—	—	—	—	—	—	—	—
<i>Dactylinia</i> sp.	—	—	—	—	—	t	—	—	—
Lichen	112	9	95	2	—	—	2	—	—
<i>Masonhalea richardsonii</i>	14	2	—	—	—	—	—	—	—
<i>Nephroma</i> sp.	—	—	—	—	—	12	1	—	—
<i>Peltigera canina</i>	—	—	—	2	—	—	4	—	—
<i>Peltigera</i> sp.	—	6	—	5	—	3	—	—	—
<i>Stereocaulon</i> sp.	—	13	—	24	—	—	—	—	—
Total, lichens	255	51	297	39	—	77	11	—	—
% of phytomass	(58.76)	(7.62)	(56.25)	(9.07)	(0.00)	(3.55)	(0.44)	(0.00)	(0.00)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Table 54—Aboveground phytomass of mosses and clubmosses on herbaceous vegetation types in the Tanana River basin**

Species	Vegetation type									
	Closed <sup>a</sup> dwarf <sup>b</sup> shrub mat cushion sedge	Closed dwarf shrub	Open dwarf shrub dryas/ lichen	Open dwarf shrub low willow tundra	Mesic gram. herb. tussock tundra	Mesic gram. herb. sedge/ birch tundra	Wet gram. herb. sedge tundra	Wet gram. herb. fresh grass marsh	Wet gram. herb. low grass meadow	Wet byroid herb.
<i>Kilograms per hectare</i>										
<i>Aulacomnium</i> sp.	—	63	—	28	2	25	—	7	—	—
<i>Brachythecium</i> sp.	—	—	—	—	—	—	23	—	—	—
<i>Dicranum</i> sp.	—	67	—	15	—	27	—	—	—	—
<i>Ditrichum</i> sp.	—	—	4	—	—	—	—	—	—	—
<i>Drepanocladus</i> sp.	—	—	—	1	—	—	—	—	—	—
<i>Hylocomium</i> sp.	—	—	—	—	—	29	—	—	—	—
<i>Hylocomium splendens</i>	—	34	—	—	—	—	—	—	—	—
<i>Lycopodium selago</i>	1	—	—	—	—	—	—	—	—	—
<i>Mnium</i> sp.	—	—	—	4	—	—	—	—	—	—
Moss	29	15	2	35	—	—	30	—	—	—
<i>Pleurozium schreberi</i>	—	5	—	18	4	20	11	—	—	—
<i>Polytrichum</i> sp.	43	54	4	2	4	39	—	2	—	—
<i>Ptilium</i> sp.	—	—	—	—	—	—	—	—	9	—
<i>Rhacomitrium lanuginosum</i>	—	—	38	—	—	—	—	—	—	—
<i>Rhacomitrium</i> sp.	—	18	—	63	—	—	—	—	—	—
<i>Rhytidium rugosum</i>	—	t <sup>c</sup>	—	—	—	—	—	—	—	—
<i>Sphagnum</i> sp.	—	—	—	—	95	100	120	2	—	393
<i>Tomentypnum nitens</i>	—	45	—	—	—	—	—	—	—	—
<i>Tomentypnum</i> sp.	—	2	—	—	11	7	—	—	—	—
Total, mosses	73	303	48	166	116	247	184	11	9	393
% of phytomass	(16.82)	(45.29)	(9.09)	(38.60)	(3.63)	(11.39)	(7.38)	(0.18)	(0.04)	(22.32)

— = plant not sampled in this type.

<sup>a</sup> Closed and open refer to crown-canopy closure. A closed type has 75-percent foliar cover in shrubs. An open type has 25- to 74-percent shrub-canopy cover closure.

<sup>b</sup> Tall shrubs are greater than 1.5 meters tall. Low shrubs are 20 centimeters to 1.5 meters tall. Dwarf scrub is less than 20 centimeters tall.

<sup>c</sup> t = trace, less than 1 kilogram per hectare.

**Appendix H: List  
of Scientific Plant  
Names, Frequencies,  
and Coefficients**

**Table 55—Scientific name authority, frequency of forb species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name**

Scientific name	Frequency	Coefficient	Common name
<i>Achillea</i> L.	2	1.28	Yarrow
<i>Aconitum delphinifolium</i> DC.	5	.96	Monkshood
<i>Actaea rubra</i> (Ait.) Willd.	1	3.50	Baneberry
<i>Anemone narcissiflora</i> L.	10	1.86	Narcissus-flowered anemone
<i>Anemone richardsonii</i> Hook.	1	1.86	Yellow anemone
<i>Anemone</i> L.	2	1.86	Anemone
<i>Antennaria friesiana</i> (Trautv.) Ekman	4	6.76	Pussytoes
<i>Antennaria</i> Gaertn.	4	3.79	Pussytoes
<i>Arabis arenicola</i> (Richards.) Gelert	6	1.81	Sand rockcress
<i>Arnica</i> L.	2	3.50	Arnica
<i>Aster sibiricus</i> L.	2	1.88	Siberian aster
<i>Aster</i> L.	2	1.88	Aster
<i>Astragalus</i> L.	7	1.28	Milkvetch
<i>Boschniakia rossica</i> (Cham. & Schlecht.) Fedtsch.	5	2.94	Ground-cone
<i>Boykinia richardsonii</i> (Hook.) Gray	2	1.86	Richardson's boykinia
<i>Caltha leptosepala</i> DC.	2	3.79	Mountain marsh marigold
<i>Caltha palustris</i> L.	1	3.79	Yellow marsh marigold
<i>Campanula lasiocarpa</i> Cham.	5	1.81	Mountain harebell
<i>Cardamine</i> L.	1	.96	Bittercress
<i>Castilleja</i> Mutis	4	1.81	Indian paintbrush
<i>Cicuta mackenzieana</i> Raup	2	3.50	Mackenzie water hemlock
<i>Claytonia sarmentosa</i> C.A. Mey.	3	1.81	Alaska spring beauty
<i>Claytonia</i> L.	3	1.81	Spring beauty
<i>Compositae</i> family	4	3.50	Composite family
<i>Cornus canadensis</i> L. <sup>b</sup>	61	1.48	Bunchberry
<i>Cornus</i> L.	1	1.48	Dogwood
<i>Delphinium brachycentrum</i> Ledeb.	1	.96	Northern larkspur
<i>Dodecatheon frigidum</i> Cham. & Schlecht.	2	.96	North shooting-star
<i>Dodecatheon</i> L.	3	.96	Shooting-star
<i>Draba</i> L.	2	1.81	Rockcress
<i>Drosera anglica</i> Huds.	1	3.79	Long-leaf sundew
<i>Epilobium angustifolium</i> L. <sup>b</sup>	61	3.50	Common fireweed
<i>Epilobium latifolium</i> L.	13	3.50	Dwarf fireweed
<i>Epilobium</i> L.	1	3.50	Willow-herb
<i>Equisetum arvense</i> L. <sup>b</sup>	44	1.28	Meadow horsetail
<i>Equisetum fluviatile</i> L. ampl. Ehrh.	2	1.28	Swamp horsetail
<i>Equisetum palustre</i> L.	6	1.28	Marsh horsetail
<i>Equisetum pratense</i> L.	18	1.28	Meadow horsetail
<i>Equisetum scirpoides</i> Michx.	25	7.09	Dwarf scouring rush
<i>Equisetum sylvaticum</i> L.	60	1.28	Wood horsetail
<i>Equisetum</i> L.	22	1.28	Horsetail
<i>Erigeron purpuratus</i> Greene	1	1.81	Fleabane
<i>Erigeron</i> L.	1	1.81	Fleabane
Fern	3	1.88	Unknown fern

Table 55—Scientific name authority, frequency of forb species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name (continued)

Scientific name	Frequency	Coefficient	Common name
Forb	46	1.81	Unknown forb
<i>Fragaria virginiana</i> Duchesne	2	3.79	Strawberry
<i>Galium boreale</i> L.	1	3.79	Northern bedstraw
<i>Galium</i> L.	7	3.79	Bedstraw
<i>Gentiana algida</i> Pall.	4	3.79	White gentian
<i>Gentiana glauca</i> Pall.	3	3.79	Glaucous gentian
<i>Gentiana platypetala</i> Griseb.	1	3.79	Low avens
<i>Gentiana</i> L.	1	3.79	Gentian
<i>Geocaulon lividum</i> (Richards.) Fern. <sup>b</sup>	56	1.88	Northern commandra
<i>Geum rossii</i> (R.Br.) Ser.	2	1.81	Ross avens
<i>Gymnocarpium dryopteris</i> (L.) Newm.	2	1.88	Oak-fern
<i>Hedysarum</i> L.	7	3.50	Sweet-vetch
<i>Iris</i> L.	2	3.50	Iris
<i>Ligusticum mutellinoides</i> (Crantz) Willar	3	.96	—
<i>Lupinus arcticus</i> S. Wats.	7	3.79	Arctic lupine
<i>Lupinus nootkatensis</i> Donn	2	1.88	Nootka lupine
<i>Lupinus</i> L.	10	1.88	Lupine
<i>Menyanthes trifoliata</i> L.	3	1.48	Buckbean
<i>Mertensia paniculata</i> (Ait.) G. Don	75	1.88	Tall bluebell
<i>Mimulus guttatus</i> DC.	1	1.88	Yellow monkey-flower
<i>Moneses uniflora</i> (L.) Gray	1	1.86	Single delight
Mushroom	56	.00	Unknown mushroom
<i>Myosotis alpestris</i> F.W. Schmidt	2	1.88	Alpine forget-me-not
<i>Nuphar</i> Sm.	1	8.23	Pond lilly
Other unidentified	113	1.28	Other plants
<i>Oxyria digyna</i> (L.) Hill	1	1.81	Mountain sorrel
<i>Oxytropis</i> L.	3	1.81	Oxytropis
<i>Papaver lapponicum</i> (Tolm.) Nordh.	1	1.48	Arctic poppy
<i>Papaver macounii</i> Greene	2	1.48	Macoun poppy
<i>Parnassia palustris</i> L.	13	1.86	Northern Grass-of-Parnassus
<i>Pedicularis capitata</i> Adams	7	1.81	Capitate lousewort
<i>Pedicularis kanei</i> Durand	3	1.81	Kane lousewort
<i>Pedicularis labradorica</i> Wirsing	2	1.81	Labrador lousewort
<i>Pedicularis</i> L.	11	1.81	Lousewort
<i>Petasites</i> Mill.	6	3.50	Coltsfoot
<i>Petasites frigidus</i> (L.) Franch.	20	3.50	Arctic sweet coltsfoot
<i>Petasites hyperboreus</i> Rydb.	47	3.50	Far northern coltsfoot
<i>Petasites sagittatus</i> (Banks) Gray	2	3.50	Arrowleaf sweet coltsfoot
<i>Polemonium acutiflorum</i> Willd.	18	1.81	Tall jacob's ladder
<i>Polemonium</i> L.	6	1.81	Jacob's ladder
<i>Polygonum alaskanum</i> (Small) Wight	16	8.23	Wild rhubarb
<i>Polygonum bistorta</i> L.	13	8.23	Meadow bistort
<i>Polygonum</i> L.	2	8.23	Bistort
<i>Polygonum vivparum</i> L.	7	8.23	Alpine bistort

**Table 55—Scientific name authority, frequency of forb species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name (continued)**

Scientific name	Frequency	Coefficient	Common name
<i>Potentilla norvegica</i> L.	1	10.95	Norwegian cinquefoil
<i>Potentilla palustris</i> (L.) Scop. <sup>b</sup>	13	10.95	Marsh fivefinger
<i>Potentilla</i> L.	2	10.95	Cinquefoil
<i>Primula tschuktschorum</i> Kjellm.	1	1.86	Primrose
<i>Pyrola asarifolia</i> Michx.	4	3.79	Liverleaf wintergreen
<i>Pyrola grandiflora</i> Radius <sup>b</sup>	8	2.94	Large-flower wintergreen
<i>Pyrola minor</i> L.	3	3.79	Lesser wintgreen
<i>Pyrola secunda</i> L. <sup>b</sup>	8	3.79	One-sided wintgreen
<i>Pyrola</i> L. <sup>b</sup>	16	4.30	Wintergreen
<i>Ranunculus lapponicus</i> L.	2	3.79	Lapland buttercup
<i>Ranunculus</i> L.	22	3.79	Buttercup
<i>Rumex</i> L.	7	3.50	Dock
<i>Sanguisorba</i> L.	5	1.88	Burnet
<i>Saussurea angustifolia</i> (Willd.) DC.	21	3.50	Narrowlf saussurea
<i>Saxifraga bronchialis</i> L.	3	1.81	Spotted saxifrage
<i>Saxifraga davurica</i> Willd.	1	1.81	—
<i>Saxifraga hieracifolia</i> Waldst. & Kit.	6	3.79	Hawkweed-leaf sax
<i>Saxifraga punctata</i> L.	1	1.86	Brook saxifrage
<i>Saxifraga serpyllifolia</i> Pursh	2	1.86	Thyme-leaf saxifrage
<i>Saxifraga</i> L.	11	3.79	Saxifrage
<i>Saxifraga tricuspidata</i> Rottb.	4	3.79	Three toothed saxifrage
<i>Sedum rosea</i> (L.) Scop.	4	1.81	Roseroot
<i>Senecio lugens</i> Richards.	2	1.81	Lugen groundsel
<i>Senecio</i> L.	4	1.81	Groundsel
<i>Senecio fuscatus</i> (Jord. & Fourr.) Hayek	1	1.81	Groundsel
<i>Senecio triangularis</i> Hook.	1	.96	Arrow leaf groundsel
<i>Sibbaldia procumbens</i> L.	2	1.81	Sibbaldia
<i>Silene acaulis</i> L.	4	1.81	Moss campion
<i>Smilacina stellata</i> (L.) Desf.	1	3.50	Starry solomon seal
<i>Solidago multiradiata</i> Ait.	7	1.88	Northern goldenrod
<i>Solidago decumbens</i> Greene	1	1.88	Dwarf goldenrod
<i>Spiranthes romanzoffiana</i> Cham.	4	1.81	Ladies' tresses
<i>Stellaria calycantha</i> (Ledeb.) Bong.	2	1.28	Calyxeye starwort
<i>Stellaria longipes</i> Goldie	1	1.28	Large stalked starwort
<i>Stellaria</i> L.	19	1.28	Chickweed
<i>Taraxacum</i> Zinn	1	1.81	Dandelion
<i>Thalictrum</i> L.	4	.96	Meadow Rue
<i>Tofieldia pusilla</i> (Michx.) Pers.	2	3.70	Scotch asphodel
<i>Tofieldia</i> Huds.	1	3.70	Asphodel
<i>Trientalis europaea</i> L.	3	1.48	Starflower
<i>Typha</i> L.	1	3.70	Common cattail
<i>Valeriana capitata</i> L.	15	.96	Capitate valerian
<i>Viola epipsila</i> Ledeb.	1	2.94	Marsh violet
<i>Viola</i> L.	7	2.94	Violet

**Table 55—Scientific name authority, frequency of forb species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name (continued)**

Scientific name	Frequency	Coefficient	Common name
<i>Woodsia alpina</i> (Bolton) S. F. Gray	1	1.28	Alpine woodsia
<i>Woodsia ilvensis</i> (L.) R. Br.	1	1.28	Rusty ilvensis
<i>Zygadenus elegans</i> Pursh	8	2.28	White death camas

— = no common name.

<sup>a</sup> Coefficients are used in the following equation to determine plant weight. Phytomass = [(% foliar cover of first layer) (coefficient) (height of first layer in decimeters) + [(% foliar cover of second layer) (coefficient) (height of second layer in decimeters)] ... + [(% foliar cover of layer n) (coefficient) (height of layer n in decimeters)].

<sup>b</sup> Species for which a phytomass coefficient was developed. Other species were assigned coefficients of the most similar species. Source of scientific names: Hulten, 1974.

**Table 56—Scientific name authority, frequency of grass and grasslike species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name**

Scientific name	Frequency	Coefficient	Common name
<i>Agropyron</i> Gaertn.	3	2.28	Wheatgrass
<i>Calamagrostis canadensis</i> (Michx.) Beauv. <sup>b</sup>	131	2.38	Bluejoint
<i>Calamagrostis</i> Adans.	5	2.38	Reed bent grass
<i>Carex aquatilis</i> Wahlenb. <sup>b</sup>	2	4.56	Water sedge
<i>Carex atratiformis</i> Britt. <sup>b</sup>	1	2.92	Black sedge
<i>Carex rostrata</i> Stokes	2	2.38	Beaked sedge
<i>Carex</i> L. <sup>b</sup>	172	2.85	Sedge
<i>Eriophorum</i> L. <sup>b</sup>	13	3.70	Cottongrass
<i>Festuca altaica</i> Trin.	10	2.92	Altai fescue
<i>Festuca</i> L.	5	2.92	Fescue
Grass	108	2.28	Unknown grass
<i>Hierochloe alpina</i> (Sw.) Roem. & Schult.	17	2.38	Alpine holy grass
<i>Juncus</i> L.	2	2.28	Rush
<i>Poa</i> L.	1	4.56	Bluegrass
<i>Scirpus</i> L.	2	2.28	Bulrush
<i>Trisetum spicatum</i> (L.) Richter	2	2.28	Downy oatgrass

<sup>a</sup> Coefficients are used in the following equation to determine plant weight. Phytomass = [(% foliar cover of first layer) (coefficient) (height of first layer in decimeters) + [(% foliar cover of second layer) (coefficient) (height of second layer in decimeters)] ... + [(% foliar cover of layer n) (coefficient) (height of layer n in decimeters)].

<sup>b</sup> Species for which a phytomass coefficient was developed. Other species were assigned coefficients of the most similar species. Source of scientific names: Hulten 1974.

**Table 57—Scientific name authority, frequency of lichen species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name**

Scientific name	Frequency	Coefficient	Common name
<i>Cetraria</i>	16	5.63	Iceland moss
<i>Cetraria islandica</i> (L.) Ach. <sup>b</sup>	30	5.63	Reindeer moss
<i>Cetraria cucullata</i> (Bell.) Ach. <sup>b</sup>	58	4.77	Reindeer moss
<i>Cetraria nivalis</i> (L.) Ach.	18	5.63	Reindeer moss
<i>Cladonia</i> <sup>b</sup>	150	4.32	Fruticose lichen
<i>Cladonia coccifera</i> (L.) Willd.	1	4.32	Fruticose lichen
<i>Cladonia coniocraea</i> (Flk.) Spreng.	1	4.32	Fruticose lichen
<i>Cladina</i> <sup>b</sup>	134	7.41	Reindeer moss
<i>Cladina mitis</i> (Sandst.) Hale & Culb.	26	4.32	Reindeer moss
<i>Cladina rangiferina</i> (L.) Harm.	2	7.41	Reindeer moss
<i>Cladina stellaris</i> (Opiz) Brodo	6	7.41	Reindeer moss
<i>Dactylina</i>	2	4.32	Finger lichen
<i>Dactylina arctica</i> (Hook.) Nyl.	8	4.32	Arctic finger lichen
Lichen	59	4.98	Unknown lichen
<i>Masonhalea richardsonii</i>	23	4.77	—
<i>Nephroma</i>	36	4.98	—
<i>Nephroma arcticum</i> (L.) Torss.	14	4.98	Lettuce lichen
<i>Parmelia</i>	4	4.98	—
<i>Peltigera</i>	114	4.98	Veined lichen
<i>Peltigera canina</i> (L.) Willd.	41	4.98	—
<i>Polyblastia</i> <sup>b</sup>	2	0.23	Polyblast lichen
<i>Stereocaulon</i>	48	4.76	Stereocaulon lichen
<i>Stereocaulon paschale</i> (L.) Hoffm.	1	4.76	Blue sandy lichen

— = no common name.

<sup>a</sup> Coefficients are used in the following equation to determine plant weight. Phytomass = [(% foliar cover of first layer) (coefficient) (height of first layer in decimeters) + [(% foliar cover of second layer) (coefficient) (height of second layer in decimeters)] ... + [(% foliar cover of layer n) (coefficient) (height of layer n in decimeters)]]

<sup>b</sup> Species for which a phytomass coefficient was developed. Other species were assigned coefficients of the most similar species. Source of scientific names: Hale 1979.

**Table 58—Scientific name authority, frequency of mosses and clubmosses occurrence on sampled plots and liverworts species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name**

Scientific name	Frequency	Coefficient	Common name
<i>Aulacomnium</i> Schwaegr. <sup>b</sup>	126	4.73	Bog moss
<i>Brachythecium</i> BSG <sup>b</sup>	21	3.61	Brachythecium moss
<i>Bryum</i> Hedw.	2	3.92	Bryum moss
<i>Climacium dendroides</i> (Hedw.) Web. & Mohr	1	2.32	Northern tree moss
<i>Dicranum</i> Hedw. <sup>b</sup>	72	7.29	—
<i>Distichium</i> BSG	6	15.50	—
<i>Ditrichum</i> Hampe	1	15.50	—
<i>Drepanocladus</i> (C.M.) Roth	5	2.32	—
<i>Fissidens</i> Hedw.	4	—	—
<i>Hepaticae</i> <sup>b</sup>	2	1.79	Liverwort
<i>Hylocomium</i> BSG	31	2.20	Feathermoss
<i>Hylocomium splendens</i> (Hedw.) BSG	187	7.20	—
<i>Lycopodium alpinum</i> (L.) Rothm.	2	3.61	Alpine clubmoss
<i>Lycopodium annotinum</i> L.	32	3.61	Stiff clubmoss
<i>Lycopodium complanatum</i> L.	14	3.61	Ground cedar
<i>Lycopodium selago</i> L.	1	3.61	Fir clubmoss
<i>Lycopodium</i> L.	7	3.61	Clubmoss
<i>Mnium</i> Hedw., nom. cons.	16	3.92	—
Moss	90	3.92	Unknown moss
<i>Paludella squarrosa</i> (Hedw.) Brid. <sup>b</sup>	3	3.61	—
<i>Pleurozium schreberi</i> (Brid.) Mitt. <sup>b</sup>	162	3.52	Schreber's moss
<i>Polytrichum juniperum</i> Hedw. <sup>b</sup>	1	3.92	—
<i>Polytrichum</i> Hedw.	136	3.92	—
<i>Ptilium ciliare</i>	2	3.52	Moss
<i>Ptilium crista-castrensis</i> (Hedw.) De Not.	18	3.52	Knight's plume
<i>Ptilium</i> De Not.	3	3.52	Plume moss
<i>Rhacomitrium lanuginosum</i> (Hedw.) Brid.	5	3.61	—
<i>Rhacomitrium</i> Brid.	6	3.61	—
<i>Rhytidadelphus triquetrus</i> (Hedw.) Warnst. <sup>b</sup>	5	2.32	Shaggy moss
<i>Rhytidium rugosum</i> (Sull.) Kindg.	10	—	—
<i>Rhytidium</i>	4	3.61	—
<i>Sphagnum</i> L. <sup>b</sup>	134	4.76	Sphagnum moss
<i>Splachnum luteum</i> Hedw.	1	4.73	Dung umbrella moss
<i>Thuidium</i> BSG	2	7.20	Fern moss
<i>Tomenthypnum nitens</i> (Hedw.) Loeske	6	3.61	Tomenthypnum
<i>Tomenthypnum</i> Loeske	22	3.61	Tomenthypnum

— = no common name.

<sup>a</sup> Coefficients are used in the following equation to determine plant weight. Phytomass = [(% foliar cover of first layer) (coefficient) (height of first layer in decimeters) + [(% foliar cover of second layer) (coefficient) (height of second layer in decimeters)] ... + [(% foliar cover of layer n) (coefficient) (height of layer n in decimeters)].

<sup>b</sup> Species for which a phytomass coefficient was developed. Other species were assigned coefficients of the most similar species. Source of scientific names: Crum 1976.

**Table 59—Scientific name authority, frequency of shrub species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name**

Scientific name	Frequency	Coefficient	Common name
<i>Alnus crispa</i> (Ait.) Pursh <sup>b</sup>	114	4.50	American green alder
<i>Alnus sinuata</i> (Reg.) Rydb.	21	4.43	Sitka alder
<i>Alnus tenuifolia</i> Nutt. <sup>b</sup>	6	4.43	Thinleaf alder
<i>Andromeda polifolia</i> L.	14	10.32	Bog rosemary
<i>Anemone parviflora</i> Michx.	1	1.86	North anemone
<i>Arctostaphylos alpina</i> L. Spreng.	5	6.76	Alpine bearberry
<i>Arctostaphylos rubra</i> (Rehd. & Wilson) Fern.	58	6.76	Alpine bearberry
<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	16	2.23	Kinnikinnik
<i>Artemisia arctica</i> Less.	9	1.88	Arctic wormwood
<i>Artemisia</i> L.	8	1.88	Sagebrush
<i>Artemisia tilesii</i> Ledeb.	4	1.88	Aleutian mugwort
<i>Betula glandulosa</i> Michx. <sup>b</sup>	78	9.00	Resin birch
<i>Betula nana</i> L. <sup>b</sup>	94	10.15	Dwarf arctic birch
<i>Betula occidentalis</i> Hook. <sup>b</sup>	13	7.17	Dwarf birch
<i>Cassiope tetragona</i> (L.) D. Don	22	1.81	Four-angle heather
<i>Chamaedaphne calyculata</i> (L.) Moench	40	6.20	Leatherleaf
<i>Diapensia lapponica</i> L.	10	1.81	Diapensia
<i>Dryas integrifolia</i> M. Vahl	2	1.81	Entire-leaf mountain-avens
<i>Dryas octopetala</i> L.	22	1.81	White mountain-avens
<i>Dryas</i> L. <sup>b</sup>	13	1.81	Mountain-avens
<i>Empetrum nigrum</i> L. <sup>b</sup>	105	2.41	Black crowberry
<i>Juniperus communis</i> L.	11	10.15	Common mountain juniper
<i>Ledum groenlandicum</i> Oeder <sup>b</sup>	161	8.23	Labrador-tea
<i>Ledum palustre</i> var. <i>decumbens</i> (L.) Ait. <sup>b</sup>	108	10.32	Northern labrador-tea
<i>Linnaea borealis</i> L. <sup>b</sup>	54	3.29	Twin flower
<i>Loiseleuria procumbens</i> (L.) Desv. <sup>b</sup>	8	6.76	Alpine azalea
<i>Myrica gale</i> L.	2	6.20	Sweet gale
<i>Potentilla fruticosa</i> L.	34	10.95	Bush cinquefoil
<i>Rhododendron lapponicum</i> (L.) Wahlenb.	1	6.76	Lapland rosebay
<i>Rhododendron</i> L.	1	6.76	Rhododendron
<i>Ribes hudsonianum</i> Richards.	1	3.45	Northern black currant
<i>Ribes</i> L.	5	3.45	Currant
<i>Ribes triste</i> Pall. <sup>b</sup>	25	3.45	American red currant
<i>Rosa acicularis</i> Lindl. <sup>b</sup>	113	2.20	Prickly rose
<i>Rubus arcticus</i> L.	23	1.86	Nagoon berry
<i>Rubus chamaemorus</i> L. <sup>b</sup>	60	1.86	Cloudberry
<i>Rubus idaeus</i> L.	1	2.20	American red raspberry
<i>Rubus pedatus</i> Sm.	1	1.86	Five-leaf bramble
<i>Rubus</i> L.	1	1.86	Raspberry
<i>Rubus spectabilis</i> Pursh	2	2.20	Salmonberry
<i>Rumex arcticus</i> Trautv.	5	3.50	Arctic dock
<i>Salix alaxensis</i> (Andersss.) Cov. <sup>b</sup>	9	6.45	Feltleaf willow
<i>Salix arbusculoides</i> Andersss.	2	8.70	Littleleaf willow
<i>Salix arctica</i> Pall.	1	10.15	Arctic willow
<i>Salix bebbiana</i> Sarg. <sup>b</sup>	9	4.39	Bebb willow
<i>Salix glauca</i> L.	45	8.70	Greyleaf willow

**Table 59—Scientific name authority, frequency of shrub species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name (continued)**

Scientific name	Frequency	Coefficient	Common name
<i>Salix interior</i> Rowlee <sup>b</sup>	2	5.16	Sandbar willow
<i>Salix lanata</i> L.	7	8.70	Lanate willow
<i>Salix monticola</i> Bebb	6	8.70	Park willow
<i>Salix myrtillifolia</i> Anders.	8	6.20	Low blueberry willow
<i>Salix phlebophylla</i> Anderss. <sup>b</sup>	7	5.16	Skeletonleaf willow
<i>Salix planifolia</i> Pursh <sup>b</sup>	52	6.98	Diamondleaf willow
<i>Salix polaris</i> Wahlenb.	9	1.48	Polar willow
<i>Salix reticulata</i> L.	30	2.23	Netleaf willow
<i>Salix</i> L.	186	5.16	Willow
<i>Shepherdia canadensis</i> (L.) Nutt. <sup>b</sup>	20	6.20	Buffaloberry
<i>Sorbus scopulina</i> Greene	1	8.70	Greene mountain ash
<i>Spiraea beauverdiana</i> Schneid.	53	10.95	Beauverd spirea
<i>Vaccinium oxycoccus</i> var. <i>microcarpus</i> (Turcz.) Fedtsch. & Flerov. <sup>b</sup>	21	2.41	Bog cranberry
<i>Vaccinium vitis-idaea</i> L. <sup>b</sup>	245	2.23	Lowbush cranberry
<i>Vaccinium uliginosum</i> L. <sup>b</sup>	209	11.64	Bog blueberry
<i>Viburnum edule</i> (Michx.) Raf. <sup>b</sup>	18	4.29	Highbush cranberry

<sup>a</sup> Coefficients are used in the following equation to determine plant weight. Phytomass = [(% foliar cover of first layer) (coefficient) (height of first layer in decimeters) + [(% foliar cover of second layer) (coefficient) (height of second layer in decimeters)] ... + [(% foliar cover of layer n) (coefficient) (height of layer n in decimeters)].

<sup>b</sup> Species for which a phytomass coefficient was developed. Other species were assigned coefficients of the most similar species. Source of scientific names: Hulten (1974) and Viereck and Little (1972).

**Table 60—Scientific name authority, frequency of tree-seedling species occurrence on sampled plots, phytomass coefficient used,<sup>a</sup> and common name**

Scientific name	Frequency	Coefficient	Common name
<i>Betula papyrifera</i> Marsh.	92	9.18	Paper birch
<i>Larix laricina</i> (Du Roi) K. Koch	23	17.64	Tamarack
<i>Picea glauca</i> (Moench) Voss <sup>b</sup>	69	20.02	White spruce
<i>Picea mariana</i> (Mill.) B.S.P. <sup>b</sup>	158	17.64	Black spruce
<i>Populus balsamifera</i> L. <sup>b</sup>	11	9.33	Balsam poplar
<i>Populus tremuloides</i> Michx.	31	9.33	Quaking aspen
<i>Populus trichocarpa</i> Torr. & Gray	2	9.33	Black cottonwood

<sup>a</sup> Coefficients are used in the following equation to determine plant weight. Phytomass = [(% foliar cover of first layer) (coefficient) (height of first layer in decimeters) + [(% foliar cover of second layer) (coefficient) (height of second layer in decimeters)] ... + [(% foliar cover of layer n) (coefficient) (height of layer n in decimeters)].

<sup>b</sup> Species for which a phytomass coefficient was developed. Other species were assigned coefficients of the most similar species. Source of scientific names: Viereck and Little (1972).

**Mead, Bert R.** 1995. Plant biomass in the Tanana River basin, Alaska. Res. Pap. PNW-RP-477. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 78 p.

Vegetation biomass tables are presented for the Tanana River basin. Average biomass for each species of tree, shrub, grass, forb, lichen, and moss in the 13 forest and 30 nonforest vegetation types is shown. These data combined with area estimates for each vegetation type provide a tool for estimating habitat carrying capacity for many wildlife species. Tree biomass is reported for the entire aboveground tree, thereby allowing estimates of total fiber content.

**Keywords:** Biomass, phytomass, Tanana River basin, Alaska, plant ecology.

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